

***User manual and
installation guide***

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About the manual

The manual describes the features of your SEC-HD and how to use them; it does not describe ventilation strategies or equipment you can connect to the control.

The manual uses the following styles.

- ◆ All buttons and menu commands are **bolded**.
For example, "Press **Program** until the LED for Alarm is lit."
- ◆ All LED display examples are in a seven-segment font.
For example, "Press **Up** or **Down** until **R 20** displays and then press **Select**."

Hint/tip



This is a hint or tip. It contains helpful information that might make it easier for you to set up or use your SEC-HD.

Note



This is a note. It contains information that may help you better understand your SEC-HD.

Caution



This is a **caution**. It contains important information that you must follow when installing or servicing your SEC-HD. Failure to follow this information can lead to damaged controls or equipment.

Warning



This is a **warning**. It contains important safety information that you must follow when installing or servicing your SEC-HD. Failure to follow this information can lead to damaged controls or equipment, electrical shocks, or severe injury.

How to use the manual

If you are not sure where to find something specific, look in the **Table of contents** at the front of the manual or the **Index** on page 65.

Below are some helpful suggestions.

- ◆ If you have not installed and configured your SEC-HD, read **Chapter 2: Installing your SEC-HD** on page 8 and **Chapter 3: Configuring your SEC-HD** on page 23.
- ◆ If you are ready to install, configure, or program your SEC-HD, use the worksheets starting in **Appendix D** on page 59.
- ◆ If you are not sure how to use the keypad or how to read the display and menus, read **Becoming familiar with the SEC-HD** on page 5.
- ◆ If you need to program your SEC-HD or adjust settings (set points, growth curves, fan speeds, etc.), read **Chapter 4: Programming the SEC-HD** on page 29.
- ◆ If you have an alarm condition or warning displayed and are not sure what it means, look at **Appendix B: Troubleshooting** on page 54.
- ◆ If you are not sure of the meaning of a term, look it up in the **Glossary** on page 52.

Limited warranty

This warranty applies only to the Phason Staged Environment Control (SEC-HD). If you need warranty service, return the product and original proof of purchase to your dealer.

Phason Inc. (Phason) warrants the SEC-HD subject to the following terms and conditions.

This warranty is valid only to the original purchaser of the product, for two years from the manufacturing date. The manufacturing date is stated in the first eight digits of the serial number in the form year-month-day.

Phason hereby warrants that should the SEC-HD fail because of improper workmanship, Phason will repair the unit, effecting all necessary parts replacements without charge for either parts or labor.

Conditions

- ◆ Installation must be done according to our enclosed installation instructions.
- ◆ The product must not have been previously altered, modified, or repaired by anyone other than Phason.
- ◆ The product must not have been involved in an accident, misused, abused, or operated or installed contrary to the instructions in our user and/or installation manuals. Phason's opinion about these items is final.
- ◆ The person requesting warranty service must be the original purchaser of the unit, and provide proof of purchase upon request.
- ◆ All transportation charges for products submitted for warranty must be paid by the purchaser.

Except to the extent prohibited by applicable law, no other warranties, whether expressed or implied, including warranties of merchantability and fitness for a particular purpose, shall apply to the SEC-HD. Any implied warranties are excluded.

Phason is not liable for consequential damages caused by the SEC-HD.

Phason does not assume or authorize any representatives, or other people, to assume any obligations or liabilities, other than those specifically stated in this warranty.

Phason reserves the right to improve or alter the SEC-HD without notice.

Service and technical support

Phason will be happy to answer all technical questions that will help you use your SEC-HD. Before contacting Phason, check the following:

- ◆ Read this manual for information about the feature with which you are having trouble.
- ◆ If you see an alarm message and are not sure what it means, look it up in the **Alarm and error messages** table on page 54 and then follow the instructions for resolving the alarm condition.
- ◆ If you are having a problem using your SEC-HD, look in the **Troubleshooting** table on page 55 and then follow the directions for correcting the problem.
- ◆ If you still have a problem with your SEC-HD, collect the following information:
 - ◆ The serial number
 - ◆ Any messages displayed by your SEC-HD
 - ◆ A description of the problem
 - ◆ A description of what you were doing before the problem occurred



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- ◊ Phason controls are designed and manufactured to provide reliable performance, but they are not guaranteed to be 100 percent free of defects. Even reliable products can experience occasional failures and the user should recognize this possibility.
- ◊ If Phason products are used in a life-support ventilation system where failure could result in loss or injury, the user should provide adequate back up ventilation, supplementary natural ventilation, or an independent failure-alarm system. The user's lack of such precautions acknowledges their willingness to accept the risk of such loss or injury.

Table of contents

Chapter 1: Introducing the SEC-HD	1
Introducing the SEC-HD	1
Common applications.....	1
Features	2
Optional accessories	3
Becoming familiar with the SEC-HD	5
Menu layout	7
Chapter 2: Installing your SEC-HD	8
What you need to know before installing your SEC-HD	8
Understanding power surges and surge suppression.....	9
Reducing electrical noise using filters	9
Electrical ratings	10
Using power contactors to increase the capacity of relays.....	11
Precautions, guidelines, and warnings.....	11
SEC-HD layout.....	13
Mounting your SEC-HD	14
Connecting equipment to your SEC-HD.....	14
Connecting single-stage heating or cooling elements.....	14
Connecting variable-stage cooling elements	16
Using three-phase power	17
Connecting an alarm system.....	18
Connecting temperature probes	19
Connecting the power source	21
Finishing the installation.....	22
Verifying your connections	22
Closing the cover	22
Chapter 3: Configuring your SEC-HD	23
What you need to know before configuring your SEC-HD	23
Configuring the main control functions.....	24
Selecting the temperature units, parameter 17	24
Selecting the operating frequency, parameter 18	24
Configuring hysteresis, parameter 24	25
Configuring the stages.....	26
Configuring variable stages, parameters 19 and 20	26
Configuring relay stages, parameters 21 to 23	27
Testing the configuration	28
Chapter 4: Programming the SEC-HD	29
What you need to know before programming your SEC-HD	29
Understanding how the SEC-HD operates.....	29
Programming the parameters.....	32
Programming the group set point, parameter 1	32
Programming variable stages, parameters 2 to 9	33
Programming relay stages, parameters 10 to 14	34
Programming alarm settings, parameters 15 and 16.....	38

Chapter 5: Monitoring and maintaining your SEC-HD	41
Monitoring your SEC-HD	41
Displaying the minimum and maximum temperatures.....	41
Selecting the operating program.....	42
Acknowledging alarms	42
Testing settings and equipment	43
Using stage override mode	43
Using temperature override mode.....	44
Servicing and maintaining your SEC-HD.....	45
Enabling and disabling ventilation.....	45
Restoring the factory defaults, parameter 27	46
Saving and restoring settings, parameters 25 and 26.....	47
Displaying the firmware version, parameter 29	48
Updating the firmware, parameter 28	49
Servicing the control.....	50
Appendixes	52
Appendix A: Glossary	52
Appendix B: Troubleshooting	54
Alarm and error messages	54
Troubleshooting.....	55
Appendix C: Factory defaults.....	57
Appendix D: Installation worksheet.....	59
Appendix E: Configuration worksheets	60
Main control function worksheet.....	60
Variable stage configuration worksheet	60
Relay configuration worksheet	61
Appendix F: Settings worksheets	61
Variable stage settings worksheet.....	61
Relay stages worksheet.....	62
Alarm settings worksheet.....	62
Appendix G: Motor curves	63
Index.....	65

Chapter 1: Introducing the SEC-HD

Chapter 1 introduces you to the Staged Environment Control (SEC-HD). Read chapter 1 before reading the rest of the manual.

Topics in chapter 1 include:

- ◆ **Introducing the SEC-HD** below
- ◆ **Becoming familiar with the SEC-HD** on page 5

Introducing the SEC-HD

The SEC-HD automatically controls the temperature in a room by operating two variable speed fans and up to three single-speed fans or heaters. To control the temperature, the SEC-HD operates the connected ventilation and/or heating equipment according to program settings.

Easy to use and program

The SEC-HD comes with seven factory-configured operating programs you can easily reconfigure for your ideal situation. The easy-to-use keypad and menu system make the SEC-HD one of the easiest controls to program. The SEC-HD's advanced and powerful features are never more than a few keystrokes away.

Versatility and peace of mind

The SEC-HD has a 30-foot temperature probe that monitors temperatures and a single zone. For more versatility, you can connect four temperature probes together and use four-zone averaging. Temperature probes are available in 1, 6, 30, 75, or 150-foot lengths; you can extend them up to 500 feet using extension cable.

The SEC-HD displays alert conditions such as high and low temperatures, power failure, and low line voltage, and can also connect to an alarm siren, alarm panel, or auto-dialer. Customizable alarm settings allow you to choose which alarm conditions you want to be notified about.

Common applications

Livestock applications

Livestock applications include buildings housing calves, rabbits, goats, hogs, poultry, and turkey. In these applications, the SEC-HD often controls ventilation in a single 20 x 40-foot or smaller room.

However, the SEC-HD is not restricted to small rooms; some customers use it to control ventilation in sow breeding rooms that are 200 feet long.

Greenhouse applications

Greenhouse applications include controlling ceiling louvers, variable and single-speed fans, and heaters. Some operations use the proportional feature for misting or ground heat (water pipes).

Business and light-industrial applications

Business and light-industrial applications include machine shops, garages, and utility sheds where customers use the SEC-HD to control fans and inlets. The SEC-HD exhausts heat from the room made by equipment and/or regulates the temperature as service bays open and close.

Features

- ◆ Automatic temperature-based control, -13 to 125°F (-25 to 51.7°C) temperature range
- ◆ Seven configurable operating programs
- ◆ Two variable cooling stages for controlling fans
- ◆ Three general-purpose relays (heat or cool)
- ◆ One alarm relay (for external alarm system or siren)
- ◆ Four-character LED display and individual stage LEDs
- ◆ Minimum and maximum temperature logging
- ◆ Error code display
- ◆ Ventilation disable option
- ◆ Manual override/test mode
- ◆ Selectable motor curves
- ◆ Three-second full-power-turn-on for minimizing fan ice-up
- ◆ Power-failure settings protection
- ◆ One temperature probe input
- ◆ Thirty-foot temperature probe, extendable to 500 feet
- ◆ *Easy System* compatible—edit and store configuration and settings on a computer. For more information, visit www.phason.ca.
- ◆ Rugged enclosure (corrosion resistant, water resistant, and fire retardant)
- ◆ CSA approval
- ◆ Two-year limited warranty

Optional accessories

Several optional, convenient accessories are available to enhance and extend your SEC-HD.

SEC-HD Saver

The SEC-HD Saver is an innovative and easy-to-use product that stores a complete copy of a SEC-HD's configuration and settings. You can restore the configuration and settings any time, or even use them to set up new SEC-HDs in seconds!

Features

- ◆ Quick and easy to use
- ◆ Portable, reliable, and safe storage of configuration and settings
- ◆ Transferable to any SEC-HD that has the same firmware version
- ◆ Compact design—fits in a pocket
- ◆ 90-day limited warranty

SEC-HD Updater

The optional SEC-HD Updater is an innovative and easy-to-use product that updates a SEC-HD's firmware.

Phason constantly improves and adds new features to their products. With the SEC-HD Updater, you can update the firmware in your SEC-HD as these features become available. The SEC-HD Updater takes only seconds to use and can upgrade all the SEC-HD controls at your site.

Features

- ◆ Quick and easy to use
- ◆ Compact design—fits in a pocket
- ◆ 90-day limited warranty



Power contactors

Phason's 240-volt power contactors are heavy-duty relays that increase the load handling capability of control relays. Power contactors are ideal for secondary ventilation fans and electric heaters.

- ◆ **Power contactor relay** (PC-240): includes power contactor relay and mounting hardware for easy mounting in an enclosure.
- ◆ **Power contactor kit** (122-1): includes power contactor relay, on-off-auto switch and label, snubber filter (reduces electrical noise), and mounting hardware for easy mounting in an enclosure.
- ◆ **Power contactor unit** (129-0): includes two power contactor relays, two on-off-auto switches, and two snubber filters, mounted in a large enclosure. The enclosure has room for two additional contactor relays or kits.



Temperature probes and extension cable

Temperature probes monitor temperatures ranging from -49 to 122°F (-45 to 50°C). The probes are available in 1, 6, 30, 75, or 150-foot cable lengths and can be extended up to 500 feet using extension cable.

Extension cable is available in 500-foot lengths.



Features

- ◆ Easy installation
- ◆ Rugged and durable design
- ◆ Weather and UV-resistant cable
- ◆ 90-day limited warranty

Parts and kits

Display kit

Should the display of your SEC-HD control fail, you can replace it with a kit. After replacing the display, you will need to reconfigure and program control.

The display kit is model **K310056**.

Control kits

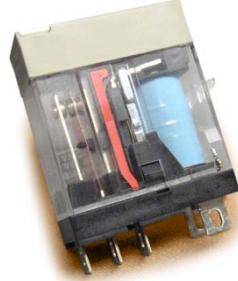
Should the bottom circuit board of your SEC-HD control fail, there are two models of control kits available.

- ◆ **KSEC-HD-B** has standard, soldered relays. This control board comes with the SEC-HD standard version.
- ◆ **K102206-RS** has socketed, pluggable relays. This control board comes with the SEC-HD RS version.

Either circuit board works with any PEC Plus control. The advantage of the RS version is that you can replace individual relays instead of the whole circuit board.

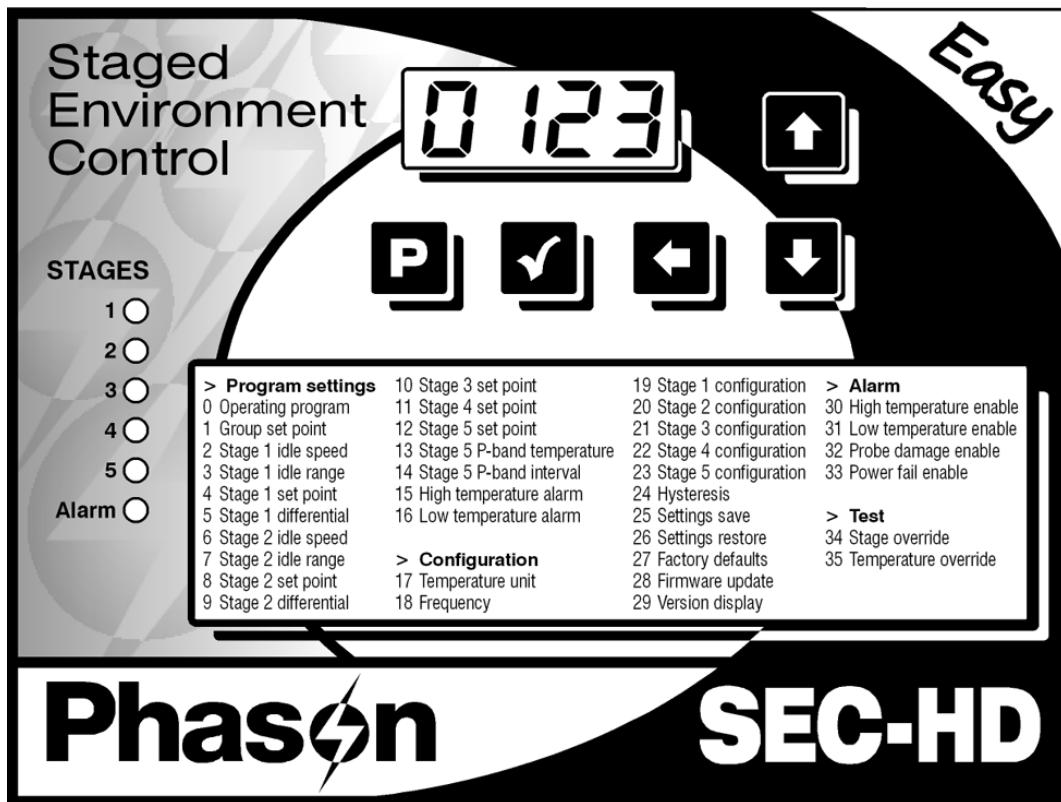
Replacement relays

If you have the SEC-HD RS version, the relays in the bottom circuit board are replaceable. Phason sells packages of five relays. The relay package is model number **PKG-R52**.



Becoming familiar with the SEC-HD

The SEC-HD has a four-character LED display, status LEDs for each variable stage and relay, and five buttons for programming and interacting with the control.



Main display

Main display The four-character, seven-segment LED display shows ambient temperatures, alarm messages, and programming information.

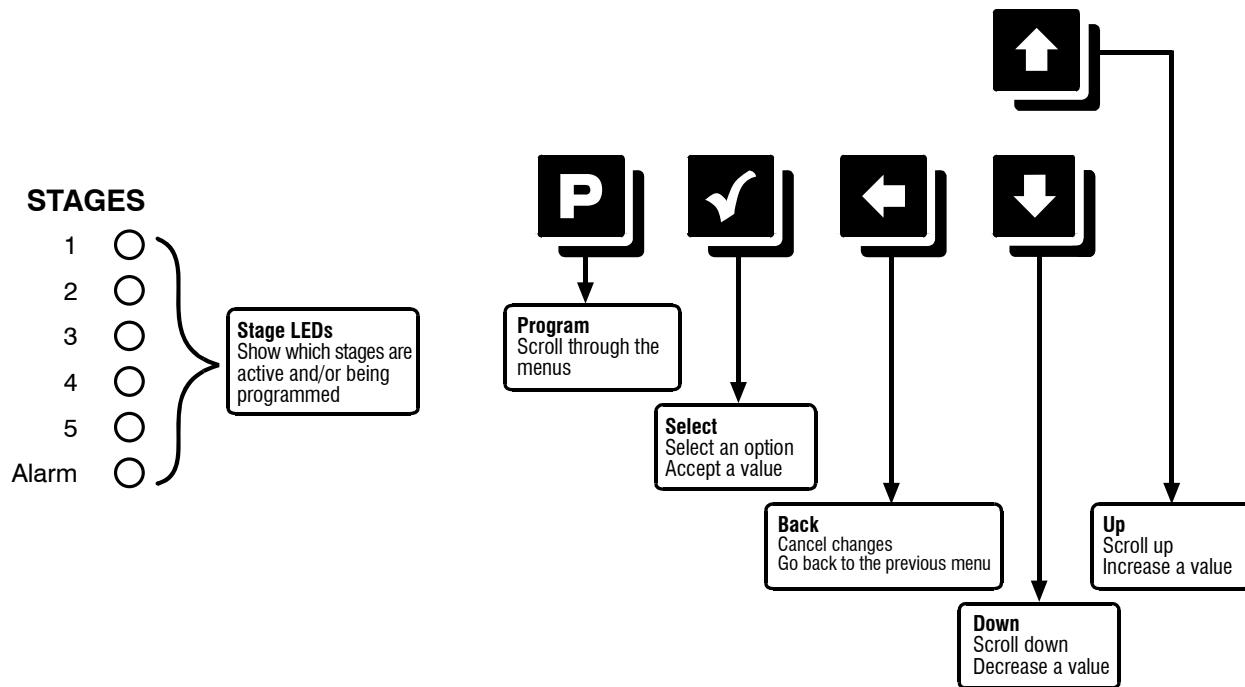
If there is a dot in the top left corner of the display, you are in an editable menu.



If you leave the SEC-HD in a menu or display other than the main display, the control returns to the main display after five minutes without any key presses. The only exceptions are stage override mode and temperature override mode; the control remains in these modes until you manually exit them.

Buttons and status LEDs

The five control buttons (**Program**, **Select**, **Back**, **Down**, and **Up**) allow you to scroll through the program menus and enter programming information.



Menu layout

Press **Program** to cycle through the menus.

Main menu	
Display	Description
R Pr	Program A
b Pr	Program B
c Pr	Program C
d Pr	Program D
e Pr	Program E
f Pr	Program F
g Pr	Program G
Co,F	Configuration
Al,E,n	Alarm enable
t,E5,t	Test
U,E1,t	Ventilation On/Off

Configuration menu	
Display	Description
17	Temperature unit
18	Frequency
19	Stage 1 configuration
20	Stage 2 configuration
21	Stage 3 configuration
22	Stage 4 configuration
23	Stage 5 configuration
24	Hysteresis
25	Settings save
26	Settings restore
27	Factory defaults
28	Firmware update
29	Version display

Program menu	
Display*	Description
R 0	Operating program
R 1	Group set point
R 2	Stage 1 idle speed
R 3	Stage 1 idle range
R 4	Stage 1 set point
R 5	Stage 1 differential
R 6	Stage 2 idle speed
R 7	Stage 2 idle range
R 8	Stage 2 set point
R 9	Stage 2 differential
R 10	Stage 3 set point
R 11	Stage 4 set point
R 12	Stage 5 set point
R 13	Stage 5 P-band temperature
R 14	Stage 5 P-band interval
R 15	High temperature alarm
R 16	Low temperature alarm

Press **Up** or **Down** to cycle through the menu items.

Test menu	
Display	Description
34	Stage override menu
35	Temperature override

* This is the display for program A. The display for the other programs shows the appropriate letter first.

Chapter 2: Installing your SEC-HD

Chapter 2 explains how to mount, install, and connect equipment to your SEC-HD.

Topics in chapter 2 include:

- ◆ **What you need to know before installing your SEC-HD** below
- ◆ **Connecting equipment to your SEC-HD** on page 14
- ◆ **Finishing the installation** on page 22

What you need to know before installing your SEC-HD

Before installing your SEC-HD, you need to do some initial preparation:

1. Read **Understanding power surges and surge suppression** on page 9.



- ◊ If you do not install external surge suppression devices, you risk damage to the electronics inside your SEC-HD, which may cause your SEC-HD to fail.
- ◊ Because it is not possible to *completely* protect this product internally from the effects of power surges and other transients, we *highly recommend* that you install external surge suppression devices. For specific recommendations, see your electrical contractor.
- ◊ If you do not take these precautions, you acknowledge your willingness to accept the risk of loss or injury.

2. Using **Appendix D: Installation worksheet** on page 59, list all the equipment you want to control using this SEC-HD. Install the equipment and make your electrical connections according to the sheet.
3. Using **Appendix E: Configuration worksheets** on page 60, decide which relays and variable stages you want to use for each piece of equipment, and how you want the equipment configured. You can connect more than one piece of equipment to a single relay or stage *as long as the total current draw does not exceed the relay or stage's limit*. For more information, read **Electrical ratings** on page 10.

Understanding power surges and surge suppression

Power surges can be caused by external influences (for example, lightning or utility distribution problems) or they can be caused internally (for example, starting and stopping inductive loads such as motors).

One of the most common causes of power surges is lightning. When lightning strikes the ground, it produces an enormously powerful electromagnetic field. This field affects nearby power lines, which transmit a surge to any device connected to it, such as lights, computers, or environmental controls like your SEC-HD. Lightning does not have to strike a power line to transmit a surge.

Surge suppression devices offer some protection from power surges. Because it is not possible to internally protect this product completely from the effects of power surges and other transients, Phason *highly recommend* that you install external surge suppression devices. For specific recommendations, see your electrical contractor. If you do not take these precautions, you acknowledge your willingness to accept the risk of loss or injury.

Reducing electrical noise using filters

Electrical noise is caused by high voltage transients created when inductive loads, such as power contactors, are switched on or off. The strength of the transients can be over 1000 volts and can vary with the type of equipment and wiring, as well as several other factors.

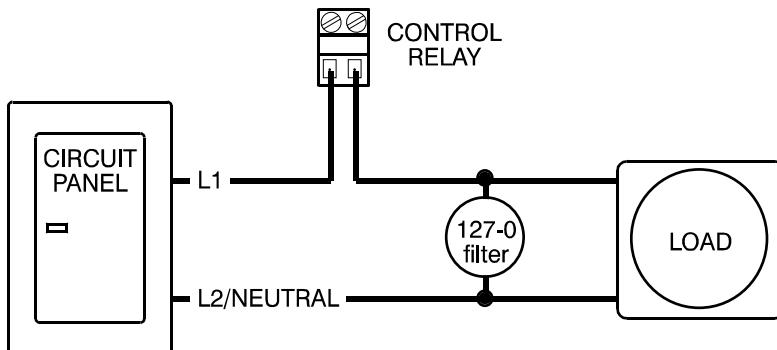
“Visible” symptoms of electrical noise include erratic control operation, cycling inlets, communication problems, and more. However, the affects of electrical noise are not always visible. Over time, electrical noise can cause electronic circuits, relay contacts, and power contactors to deteriorate.

Installing filters helps extend the life of equipment

Filters help prevent electrical noise problems by absorbing the transient energy. Even if you do not have *visible* symptoms of electrical noise, filters help keep controls operating reliably and can extend the life of the controls and equipment connected to them.

Phason’s snubber filters (part number 127-0) are for use with solenoids, timer relays, DC motors, furnaces, and other equipment connected to the control’s relays. You can also use the filters with loads connected to power contactors.

Install a filter in parallel with the load, as shown in the following example.



- ◊ Do not use Snubber filters with variable stages.
- ◊ Some power contactors include snubber filters. For more information, read **Using power contactors to increase the capacity of relays** on page 11.
- ◊ For more information about snubber filters or other Phason accessories, see your dealer or visit www.phason.ca.

Electrical ratings

Input power	120/230 VAC, 50/60 Hz
Variable stages ① (VAR 1, VAR 2)	7 FLA at 120/230 VAC, PSC motor 1/2 HP at 120 VAC, 1 HP at 230 VAC, PSC motor 10 A at 120/230 VAC, general-purpose (resistive)
Fuses (F2 and F3)	15 A, 250 VAC ABC-type ceramic
Relay stages ① (STAGE 3, STAGE 4, STAGE 5)	6 A at 120/230 VAC, general-purpose (resistive) 1/3 HP at 120 VAC, 1/2 HP at 230 VAC 360 W tungsten at 120 VAC
Fuses (F1, F4, and F5)	12 A, 250 VAC ABC-type ceramic
Alarm relay	0.4 A at 125 VAC; 2 A at 30 VDC, resistive load 0.2 A at 125 VAC; 1 A at 30 VDC, inductive load

① You can connect more than one piece of equipment to a variable stage or relay as long as they are the same type (for example, two fans) and the total current draw does not exceed the stage's limit.



The FLA (full load ampere) rating accounts for the increase in motor current draw when the motor operates at less than full speed. Make sure the motor/equipment connected to the variable stage does not draw more than 7 FLA.

Using power contactors to increase the capacity of relays

Phason's 240-volt power contactors are heavy-duty relays that allow you to increase the load handling capability of control relays. Power contactors are ideal for secondary ventilation fans and electric heaters.

Phason's power contactor relays have the following electrical ratings.

- ◆ Coil: 10.2 mA at 240 VAC
- ◆ Contact: 25 A at 240 VAC; resistive
2 HP at 240 VAC, 1 HP at 120 VAC; motor, power factor 0.4
1300 W at 120 VAC; tungsten

Phason offers three power contactor options.

- ◆ **Power contactor relay** (PC-240) includes power contactor relay and mounting hardware for easy mounting in an enclosure.
- ◆ **Power contactor kit** (122-1) includes power contactor relay, on-off-auto switch and label, snubber filter (reduces electrical noise), and mounting hardware for easy mounting in an enclosure.
- ◆ **Power contactor unit** (129-0) includes two power contactor relays, two on-off-auto switches, and two snubber filters, mounted in a large enclosure. The enclosure has room for two additional contactor relays or kits.

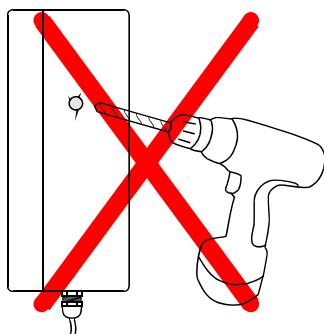
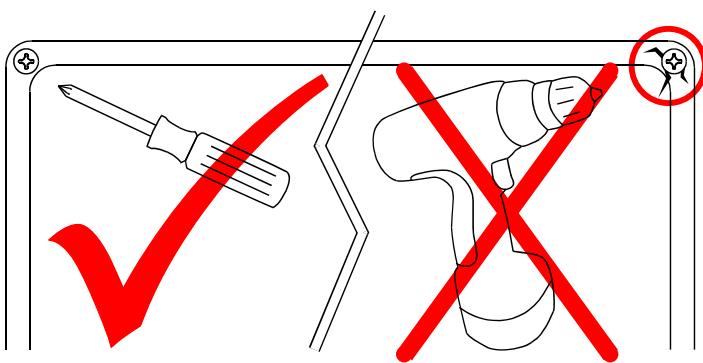
Precautions, guidelines, and warnings

Read **Servicing and maintaining your SEC-HD** on page 45.



- ◊ The SEC-HD must be installed by a qualified electrician.
- ◊ Before installing or servicing the SEC-HD, switch OFF the power at the source.
- ◊ Install the SEC-HD and all equipment connected to it according to local electrical codes.

- ◊ Mount the control on a sheltered, vertical surface, with the electrical knockouts facing down.
- ◊ Use a screwdriver to tighten the screws in the enclosure. Do not use a drill or over tighten the screws; this can crack the enclosure and ruin the watertight seal.



- ◊ Use the electrical knockouts for bringing wires or cables into or out of the enclosure. Use watertight strain reliefs or conduit connectors at all cable-entry points.
- ◊ Do not make additional holes in the enclosure; this can damage the watertight seal or control components and void the warranty.

Routing data wires

Routing data wires in the same conduit as, or beside AC power cables, can cause electrical interference, erratic readings, and/or improper control. Data wires include **all** of the following:

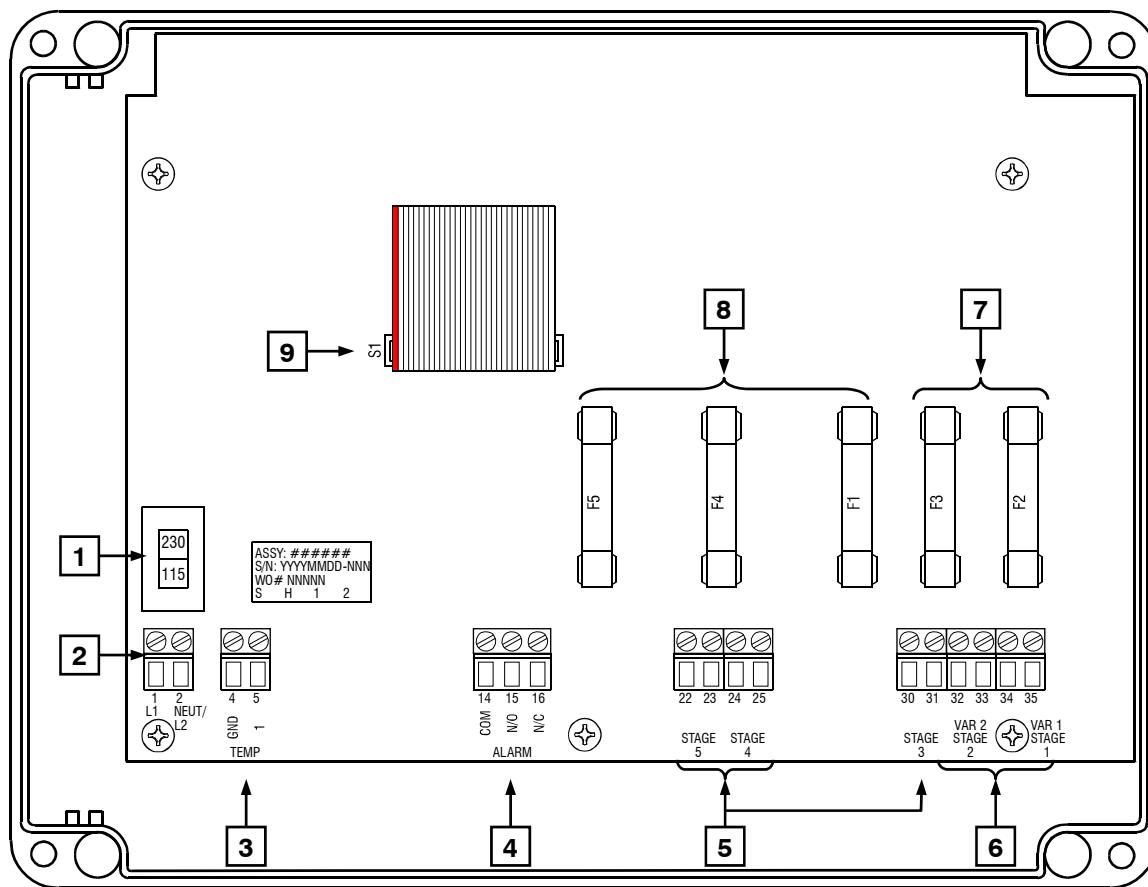
- ◆ Temperature probe and humidity sensor cables
- ◆ Actuator feedback (potentiometer) wires
- ◆ Data communication wires, including RS-232/RS-485
- ◆ Any cable or wire that does not provide AC power

Guidelines for routing data wires

- ◆ Do not run the wires in the same conduit as AC power cables.
- ◆ Do not run the wires beside AC power cables or near electrical equipment.
- ◆ When crossing other cables or power lines, cross them at a 90-degree angle.

If in doubt, **do not run any wire or cable that is not an AC-power wire** inside the same conduit or beside other AC-power wires.

SEC-HD layout



- 1 Voltage selection switch:** set this switch to the correct voltage before installing your SEC-HD.
- 2 Incoming power terminal:** connect the incoming power (120/230 VAC, 50/60 Hz) to this terminal.
- 3 Temperature probe terminal:** connect the temperature probe to this terminal.
- 4 Alarm relay terminal:** connect an external alarm system or alarm siren to this terminal.
- 5 General-purpose relay terminals (STAGE 3 to STAGE 5):** connect single stage (on/off) equipment to these terminals. You can configure these relays as heat or cool.
- 6 Variable stage terminals (VAR 1, VAR 2):** connect variable speed fans to these terminals.
- 7 Variable stage fuses (F3 for VAR 2, F2 for VAR 1):** 15 A, 250 VAC ABC-type ceramic.
- 8 Relay fuses (F1 for STAGE 3, F4 for STAGE 4, and F5 for STAGE 5):** 12 A, 250 VAC ABC-type ceramic.
- 9 Display cable:** make sure the ribbon cable from the display is properly connected to the socket.

Mounting your SEC-HD

1. Select a location for your SEC-HD. Make sure you have enough cable and wire to reach all the equipment (fans, heaters, actuators, and so on) that you want to control.
2. Remove the screws from the front cover and then gently lift it off.
3. Mount the enclosure to a wall using the four screws provided with the control. Insert the screws into the large holes in each corner of the box and tighten.

Connecting equipment to your SEC-HD

Follow all instructions when installing your SEC-HD and connecting equipment to it.



The SEC-HD's test modes are useful for testing equipment after installing and configuring it. For more information, read **Testing settings and equipment** on page 43.



Use the electrical knockouts for bringing wires or cables into or out of your SEC-HD enclosure. Do not make additional holes in the enclosure; this can damage the watertight seal or control components and void the warranty.

Connecting single-stage heating or cooling elements

Heating or cooling elements include electric heaters, furnaces, and single-speed fans.



Refer to **Appendix D: Installation worksheet** on page 59 and **Appendix E: Configuration worksheets** on page 60 when installing single-stage heating or cooling elements.



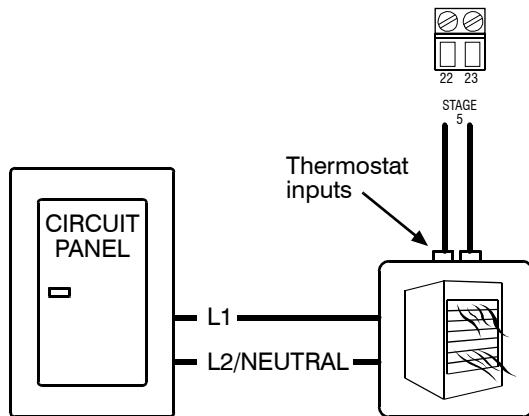
The ratings of the equipment must not exceed the ratings of your SEC-HD's relays.

Relay ratings: 6 A at 120/230 VAC, general-purpose (resistive)
1/3 HP at 120 VAC, 1/2 HP at 230 VAC
360 W tungsten at 120 VAC

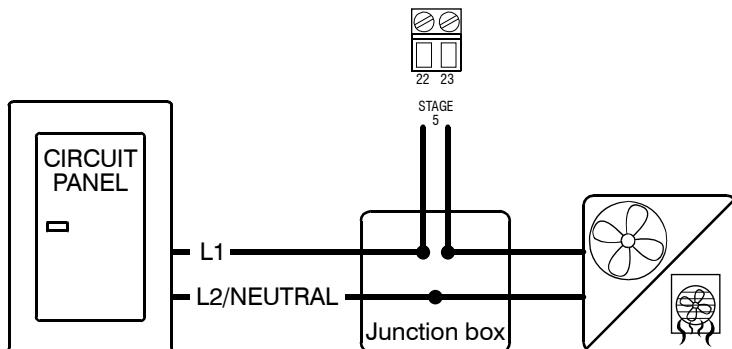
Relay fuses: 12 A, 250 VAC ABC-type ceramic

To connect single-stage heating or cooling elements

Connect single-speed heating or cooling elements to your SEC-HD as shown in the following diagrams.

Gas-fired furnace or brooder

Gas furnaces using hot-surface ignition or glow plug can draw more current than indicated on their nameplate and require power contactors. For more information, read your furnace dealer.

All other single-speed heating or cooling elements

Connecting variable-stage cooling elements

The SEC-HD has two variable-stage cooling terminals for connecting equipment such as variable-speed fans.



Refer to **Appendix D: Installation worksheet** on page 59 and **Appendix E: Configuration worksheets** on page 60 when installing variable-stage elements.

Only permanent split capacitor motors appropriate for variable speed control, or shaded pole motors, can be used on the variable stages.

- ◊ If you are using three-phase power, connect the SEC-HD and the variable cooling equipment to the same phase. For more information, read **Using three-phase power** on page 17.
- ◊ The ratings of the equipment must not exceed the ratings of your SEC-HD's variable stages.



Variable stage ratings: 7 FLA at 120/230 VAC, PSC motor

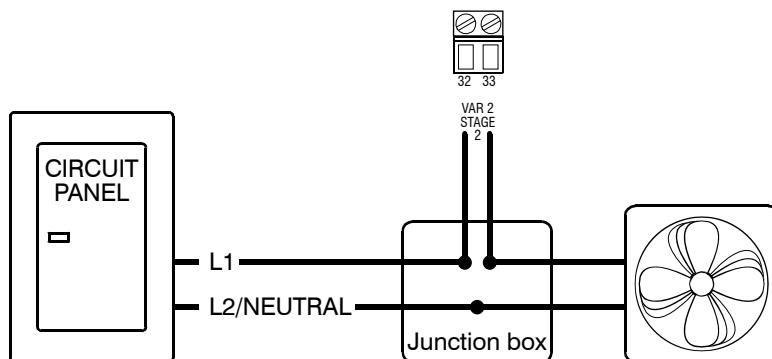
1/2 HP at 120 VAC, 1 HP at 230 VAC, PSC motor

10 A at 120/230 VAC, general-purpose (resistive)

Variable stage fuses: 15 A, 250 VAC ABC-type ceramic

To connect variable-stage cooling elements

Connect variable cooling elements to your SEC-HD as shown in the following diagram.



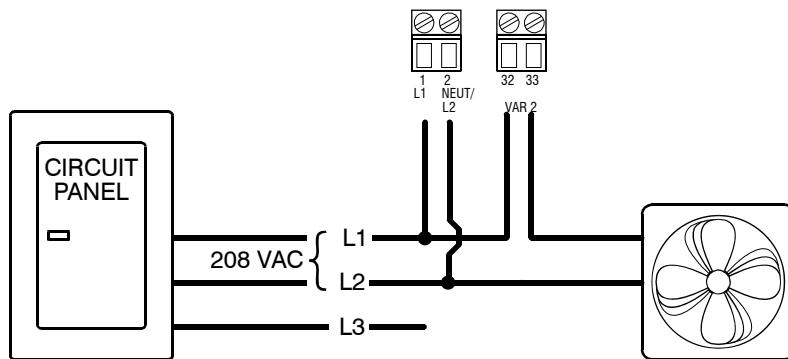
Using three-phase power

If you are connecting your SEC-HD to a three-phase system, connect the control power and the variable cooling equipment to the same phase.

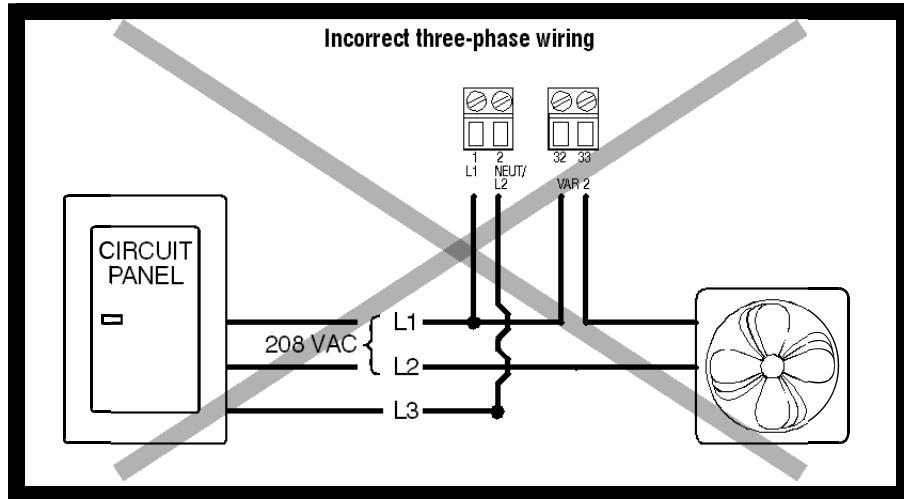
Your SEC-HD must be powered from the same phases that supply the equipment. If your SEC-HD power and the variable stages are wired to different phases, the equipment will operate erratically.

Connect the control power and variable cooling equipment as shown in the following example.

Correct three-phase wiring



Incorrect three-phase wiring



Connecting an alarm system

You can connect an alarm system to your SEC-HD's alarm terminal. An alarm system can be a siren, alarm panel, or auto-dialer. Read your system's installation guide for installation instructions and information about the type of system: *normally open* or *normally closed*. Below are the descriptions for the alarm terminal.

- ◆ **COM:** common connection
- ◆ **N/O:** normally open; closes during alarm conditions
- ◆ **N/C:** normally closed; opens during alarm conditions

For the alarm system to sound (or dial out) during an alarm condition, you must enable the alarms. For more information, read **Programming alarm settings** on page 38.



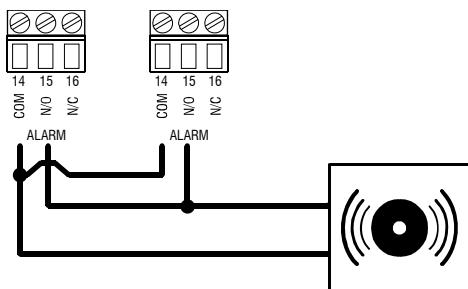
The ratings of the alarm system must not exceed the ratings of the relay.

Alarm relay ratings: 0.4 A at 125 VAC; 2 A at 30 VDC, resistive load
0.2 A at 125 VAC; 1 A at 30 VDC, inductive load

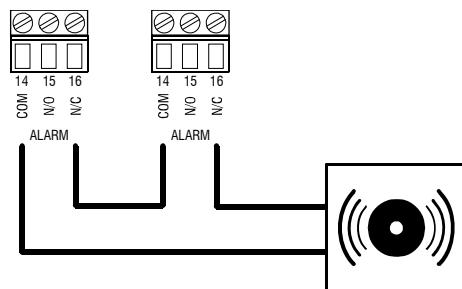
To connect an alarm system

- ◆ If you are connecting the alarm system to a network of controls and your system uses a *normally open* connection (closes on alarm), connect the system as shown in the normally open diagram.
Join all the COM connections together and all the N/O connections together. Your SEC-HD alarm relays must be in parallel with each other so any SEC-HD can trigger the alarm system when an alarm condition occurs.
- ◆ If you are connecting the alarm system to a network of controls and your system uses a *normally closed* connection (opens on alarm), connect the system as shown in the normally closed diagram.
Join the alarm relays in a continuous loop. Your SEC-HD alarm relays must be in series with each other so any SEC-HD can trigger the alarm system when an alarm condition occurs.

Normally open system (closed on alarm)



Normally closed system (open on alarm)



Connecting temperature probes



- ◊ When routing the temperature probe cables, do not run them in or along the same conduit as AC-power lines. Follow the guidelines on page 12.



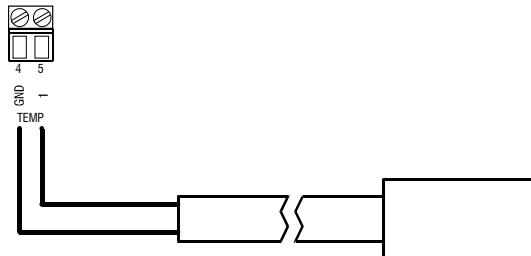
- ◊ You can extend probe cables up to 500 feet. For more information, read **To extend probe cable** below.
- ◊ You can monitor and average the temperatures in four zones. For more information, read **To use four-zone averaging** on page 20.



- ◊ Replace damaged probes as soon as possible. If there is no probe present or working properly, the SEC-HD shuts off stages 3, 4, and 5 and operates variable stages 1 and 2 at idle speed.

To connect a single temperature probe

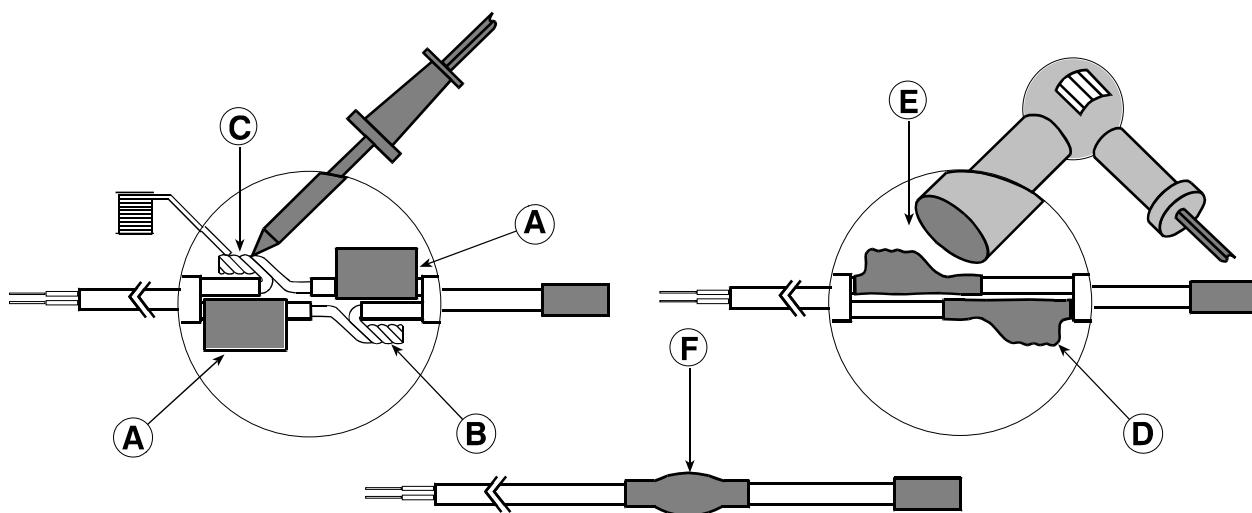
- ◆ Do not run the probe cable in the same conduit as AC power cables
- ◆ Do not run the sensor cable beside AC power cables or near electrical equipment.
- ◆ When crossing other cables or power lines, cross them at a 90-degree angle.



To extend probe cable

You can extend temperature probe cables to lengths of up to 500 feet. Follow the guidelines below and on page 12 when extending cables.

- ◆ Use 2-wire 18 AWG jacketed cable. Phason recommends Belden #9408, Alpha #5052, or an equivalent. Extension cable is also available from Phason. For more information, contact your dealer or Phason.
- ◆ Join the extension cable to the temperature probe cable as shown in the following diagram.
- ◆ If the unit operates erratically with the extended probe, run the cable along a different path or shorten it.

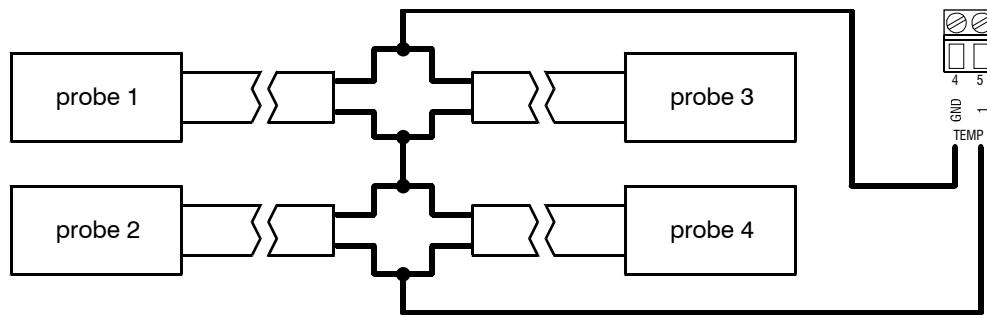


To use four-zone averaging

The SEC-HD can monitor the temperature in four different zones using four-zone averaging. The control takes an average of the temperatures measured by the four probes and then operates according to the average temperature.

NOTE You must use **four** probes for averaging. Using two, three, or more than four probes measures the temperature incorrectly.

Connect four temperature probes as shown in the following diagram. Follow the guidelines in **To extend probe cable** on page 19.



Connecting the power source

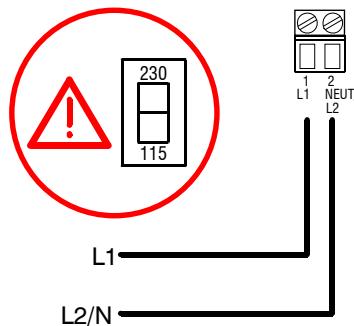
You can connect your SEC-HD to 120 or 230 VAC, 50 or 60 Hz power.

-  ◇ Before connecting the power, set the voltage selection switch to the correct voltage.
- ◇ If you are using three-phase power, make sure the control power and the variable speed fans are connected to the same phase. For more information, read **Using three-phase power** on page 17.

-  ◇ Before connecting the incoming power, switch OFF the power at the source.
- ◇ Do not switch ON the power until you have finished all wiring and verified all equipment is properly connected and free of obstructions.

To connect the incoming power source

1. Set the voltage select switch to the correct voltage setting.
2. Connect the incoming power source as shown in the following diagram.



Finishing the installation

After installing and connecting equipment to your SEC-HD, you are ready to finish the installation. Before you start configuring your SEC-HD, you need to verify the connections and close the SEC-HD.

Verifying your connections

Make sure the configuration worksheets in **Appendix E** correspond to how the equipment is connected to your SEC-HD. It is very important that the connections and the worksheets are the same, because the next step after closing the cover is to tell your SEC-HD which equipment is connected to each terminal.

Closing the cover

After you have finished connecting all equipment, wiring, and cables to your SEC-HD, it is time to verify the wires are connected properly and the close the cover.

1. Make sure all the wires are properly connected to the correct terminals.
2. Make sure the voltage selection switch is in the correct setting.
3. Make sure the display cable is properly connected. For more information, read **SEC-HD layout** on page 13.
4. Place the cover on the control.
5. Switch on the power to your SEC-HD.

When you switch on the power to your SEC-HD, the display should show ----, followed by the temperature. If the power fail alarm is enabled, it will show the message **PF**.

If the SEC-HD display does not come on, go back to step 1.

If the display shows an alarm message and/or the LED for Alarm is lit, read **Programming alarm settings, parameters 15 and** on page 38.

6. Insert the four screws into the cover and then tighten them.



Do not over tighten the screws. Avoid using power screwdrivers or drills.

Chapter 3: Configuring your SEC-HD

Chapter 3 explains how to configure your SEC-HD. Configuring your SEC-HD includes telling it which equipment is connected to each terminal. Topics in chapter 3 include:

- ◆ **What you need to know before configuring your SEC-HD** below
- ◆ **Configuring the main control functions** on page 24
- ◆ **Configuring the stages** on page 26
- ◆ **Testing the configuration** on page 28

What you need to know before configuring your SEC-HD

Configuring your SEC-HD means telling it what equipment it will be controlling and how it will be controlling that equipment. For example, your SEC-HD has three relay stages. You need to tell the stages if they will be controlling heating or cooling elements.

Before you begin configuring your SEC-HD, make sure:

- ◆ It has power
- ◆ All equipment has been properly connected to the correct terminals.
- ◆ You know which equipment is connected to which relays and variable stages



This chapter does not explain set points, idle speeds, or other settings. For information about those settings, read **Chapter 4: Programming the SEC-HD** on page 29.



- ◊ We recommend configuring *all* your control elements before programming the settings (temperature set points, idle speeds, and so on). Use the **Appendix E: Configuration worksheets** on page 60 to help you keep track of which equipment is connected to which relays and variable stages.
- ◊ If you receive an error message during configuration, look it up in **Appendix B: Troubleshooting** on page 54 and then follow the instructions for correcting the problem.
- ◊ Your SEC-HD's built-in diagnostic tests are useful for testing your equipment after installing and configuring it. For more information, read **Testing settings and equipment** on page 43.

Configuring the main control functions

Before configuring the variable and relay stages, configure the main control functions. Main control functions include:

- ◆ Temperature units
- ◆ Frequency
- ◆ Hysteresis

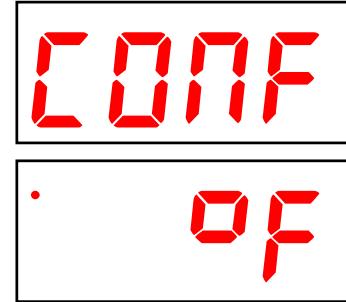
Selecting the temperature units, parameter 17

Your SEC-HD can display temperatures in either degrees Fahrenheit (°F) or degrees Celsius (°C), but not both at the same time.

Default: Fahrenheit

To select the temperature unit

1. Press **Program** until **CONF** displays and then press **Select**.
The display shows **17**, the first item in the Configuration menu.
2. Press **Select**.
The display shows the current temperature unit.
3. Press **Up** or **Down** to toggle between °F and °C and then press **Select**.
The control returns to the Configuration menu.
4. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.



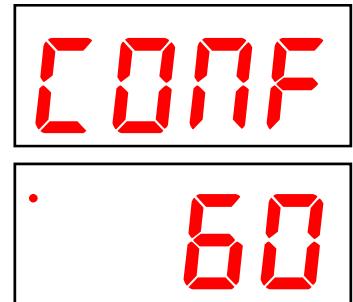
Selecting the operating frequency, parameter 18

In North America, utility companies supply power at 60 Hz. In some areas of the world, such as Europe, power is supplied 50 Hz.

Default: 60 Hz

To select the operating frequency

1. Press **Program** until **CONF** displays and then press **Select**.
The display shows **17**, the first item in the Configuration menu.
2. Press **Up** until **18** displays and then press **Select**.
The display shows the current frequency.
3. Press **Up** or **Down** to toggle between 50 and 60 and then press **Select**.
The control returns to the Configuration menu.
4. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.



Configuring hysteresis, parameter 24

Hysteresis helps prevent damage to the relays, variable stages, and the equipment connected to them by preventing the stages from switching on and off rapidly when the temperature is hovering close to the set point.

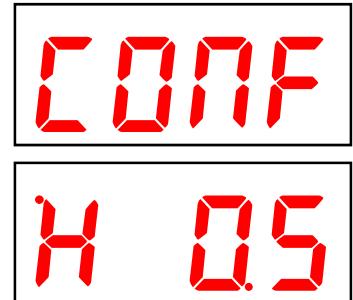
Hysteresis is the number of degrees above the set point that a heating stage or relay switches off, and the number of degrees below the set point that a cooling stage or relay switches off. For example, a household thermostat might switch on a furnace at 68 °F when the house is cooling down, but switch it off at 70 °F when the house is warming up. The difference between these two values is the hysteresis.

Default: 0.5°F (0.3°C)

Range: 0.3 to 5.0°F (0.2 to 2.8°C)

To configure the hysteresis

1. Press **Program** until **CONF** displays and then press **Select**.
The display shows **17**, the first item in the Configuration menu.
2. Press **Up** or **Down** until **24** displays and then press **Select**.
The display shows the current configuration.
3. Press **Up** or **Down** to adjust the value and then press **Select**.
The control returns to the Configuration menu.
4. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.



Configuring the stages

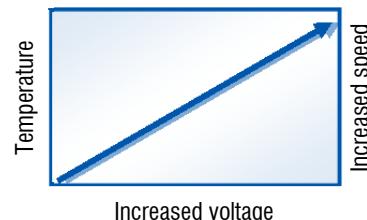
Your SEC-HD has three types of stages: two variable stages, three relay (ON/OFF) stages, and one inlet actuator stage.

Configuring variable stages, parameters 19 and 20

Variable stages 1 and 2 control elements that operate with gradually changing voltage, such as variable speed fans.

There are three configuration options.

- ◆ **Off (OFF)** – the variable stage is always off.
- ◆ **Cooling 1 (CL 1)** – the stage controls a variable speed fan using motor curve 1. Use motor curve 1 for most fans.
- ◆ **Cooling 2 to Cooling 4 (CL 2, and so on)** – the stage controls a variable speed fan using selected motor curve. Use one of motor curves 2 to 4 *only if* one of the following problems occur when using manual override to test.
 - ◆ The fan changes speed *only within* a small portion of the 0 to 100% range
 - ◆ The fan runs at full speed regardless of the 0 to 100% range



-  ◇ For more information about motor curves, including a table cross-referencing fan motors with recommended curves, read **Appendix G: Motor curves** on page 63.

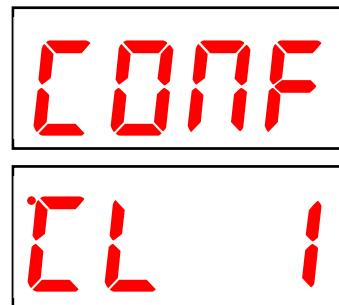
◇ Use the **Variable stage configuration worksheet** on page 60 when configuring variable stages.

◇ For more information about how variable stages work, read **Programming variable stages** on page 33.

Default: stage 1 and 2 cool

To configure variable stages

1. Press **Program** until **CONF** displays and then press **Select**.
The display shows **17**, the first item in the Configuration menu.
2. Press **Up** until **19** displays for variable 1 (or **20** for variable 2) and then press **Select**.
The display shows the current configuration.



3. Press **Up** or **Down** until the configuration you want is displayed and then press **Select**. The control returns to the Configuration menu.
4. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

Configuring relay stages, parameters 21 to 23

The SEC-HD has three relay stages you can configure as one of the following options.

- ◆ **Off**: the relay is always open (OFF).
- ◆ **On**: the relay is always closed (ON). You can use this configuration as an override.
- ◆ **Cool**: the relay controls a cooling element and is on when the temperature is above the set point.
- ◆ **Heat**: the relay controls a heating element and is on when the temperature is below the set point.
- ◆ **Proportional cool** (stage 5 only): the relay controls a water pump or sprinkler solenoid and operates as a proportional cycle timer. The relay switches on for a portion of the cycle/interval and off for the remainder. The duration the relay is on depends on the temperature. Proportional control provides better control of temperature and more efficient operation.
Typical use for proportional cooling is soaking or direct evaporative cooling, which is often used in hog and dairy operations.
- ◆ **Proportional heat** (stage 5 only): the relay controls a pump or valve and operates as a proportional cycle timer. Typical use for proportional heating is in-floor heating using water pipes, which is often in livestock buildings.

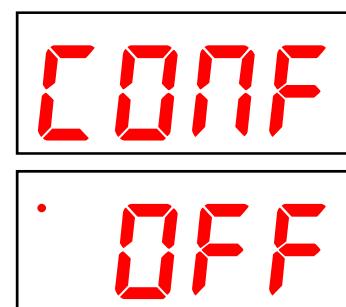


- ◊ If you need to connect more cooling elements than you have relays available, and you are not using both variable stages, you can use an available variable stage as an ON/OFF stage (for 120/230 VAC-powered equipment only). For more information, read **Programming variable stages, parameters 2 to 9** on page 33.
- ◊ Use the **Relay stages worksheet** on page 62 when configuring relays.

Defaults: stage 3 and 4 COOL, stage 5 HEAT

To configure relay stages

1. Press **Program** until **CONF** displays and then press **Select**. The display shows **11**, the first item in the Configuration menu.
2. Press **Up** until **21** displays for stage 3 (**22** for stage 4, or **23** for stage 5) and then press **Select**.



The display shows the current configuration.

3. Press **Up** or **Down** until you reach the option you want and then press **Select**.
The control returns to the Configuration menu.
4. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

Testing the configuration

After configuring all the control elements (variable stages, relays, and so on), test your SEC-HD to make sure the configuration is correct. In other words, make sure what you think is connected to a particular relay or stage *is* actually connected to that relay or stage.

You can test the configuration using the SEC-HD's stage override mode. Stage override mode allows you to operate the equipment, regardless of temperature or time. As you operate each piece of equipment, visually check to see if that equipment is doing what you tell it.

For example, when you switch on stage 3 at the SEC-HD, does the equipment you think is connected to that relay switch on?

For more information about stage override mode, read **Testing settings and equipment** on page 43.

Chapter 4: Programming the SEC-HD

Chapter 4 discusses how to program your SEC-HD with the settings it uses to control equipment.

What you need to know before programming your SEC-HD

Programming the SEC-HD basically means telling the control what you want it to do with the equipment and when you want it done. For example, for a single-speed fan set for cooling, you might say "Switch ON when the temperature reaches 80°F."

Before you begin programming your SEC-HD, make sure:

- ◆ The control has power
- ◆ You know which equipment is connected to which stages
- ◆ You have *properly connected* all equipment to the *correct terminals*.
- ◆ You have properly configured and tested all equipment connected to the variable and relay stages. For more information, read **Chapter 3: Configuring your SEC-HD** on page 23.



Use **Appendix F: Settings worksheets** on page 61 when programming your SEC-HD.

Understanding how the SEC-HD operates

Understanding how the SEC-HD operates can help you configure and program your control more efficiently, and control your environment more effectively.

The configuration and settings for the following example are the factory defaults for program A.

- ❶ **Group set point** is the target temperature for the room.
- ❷ **Stage 1 idle speed** is the speed, in percentage of full power, at which the stage 1 fan operates for minimum ventilation.
- ❸ **Stage 1 idle range** is the temperature below which the stage 1 fan is off and the inlet is closed. When the temperature is between the *idle range* and set point, the fan operates at *idle speed*.

4 Stage 1 set point is the temperature above which the stage 1 fan speed increases toward its maximum. You should set the stage 1 set point to the same temperature as the group set point.

5 Stage 1 differential is the temperature at which the stage 1 fan reaches full speed.

6 Stage 2 idle speed is the speed at which the stage 2 fan operates when the temperature is at the stage 2 idle range (number 7).

7 Stage 2 idle range is the temperature above which the stage 2 fan operates at *idle speed*.

8 Stage 2 set point is the temperature above which the stage 2 fan speed increases toward its maximum.

9 Stage 2 differential is the temperature at which the stage 2 fan reaches full speed.

10 Stage 3 set point is the temperature above which the stage 3 fan is on.

11 Stage 4 set point is the temperature above which the stage 4 fan is on.

12 Stage 5 set point is the temperature below which the stage 5 heater is on.

15 High temperature alarm is the temperature equal to or above which the SEC-HD signals a high temperature alarm.

16 Low temperature alarm is the temperature equal to or below which the SEC-HD signals a low temperature alarm.

19 Stage 1 configuration in the example and factory defaults, stage 1 is configured as *cool*.

20 Stage 2 configuration in the example and factory defaults, stage 2 is configured as *cool*.

21 Stage 3 configuration in the example and factory defaults, stage 3 is configured as *cool*.

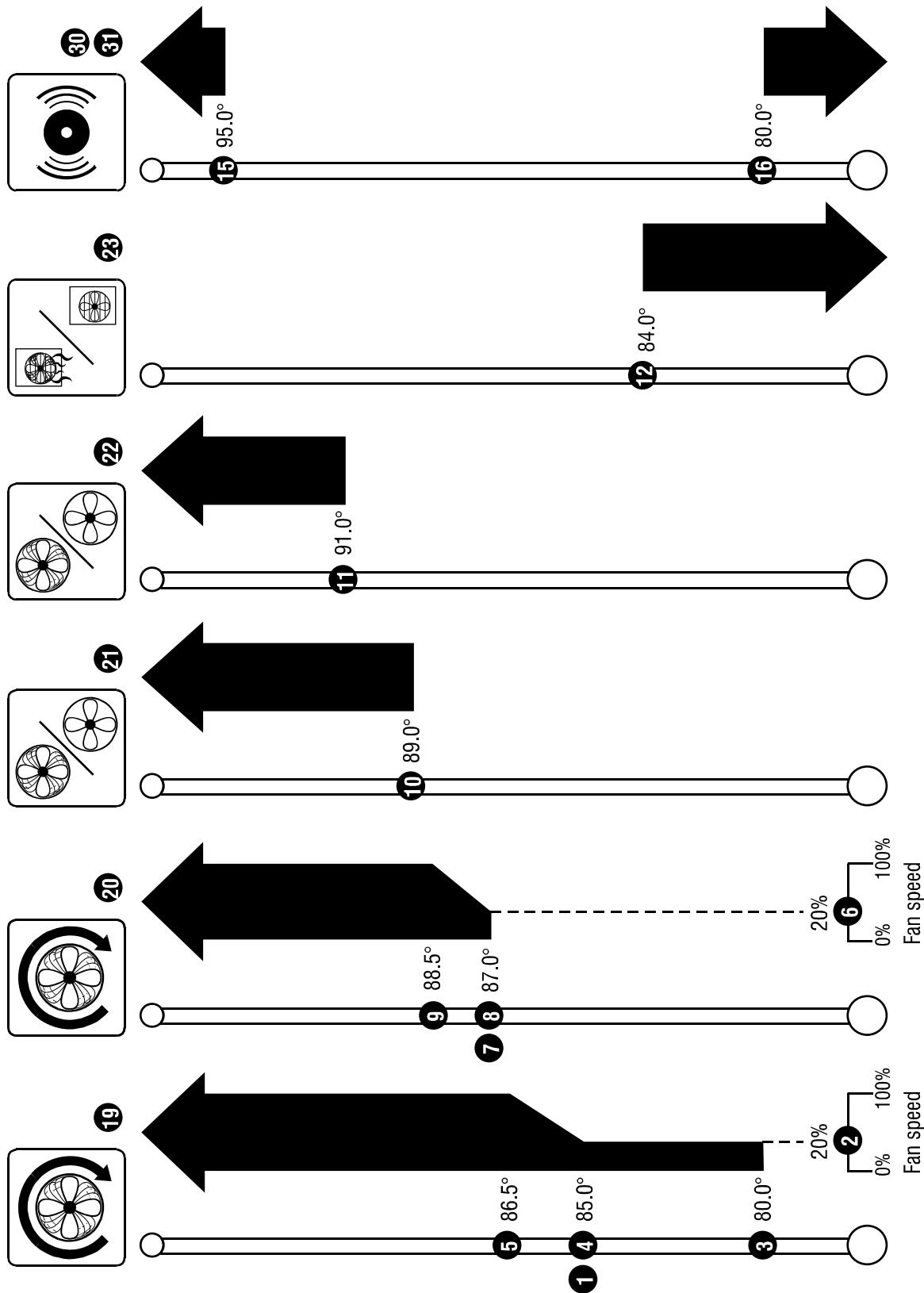
22 Stage 4 configuration in the example and factory defaults, stage 4 is configured as *cool*.

23 Stage 5 configuration in the example and factory defaults, stage 5 is configured as *heat*.

30 High temperature enable in the example and factory defaults, the high temperature alarm is enabled.

31 Low temperature enable in the example and factory defaults, the low temperature alarm is enabled.

Parameter	Program A setting
1 Group set point (°F)	85.0
2 Stage 1 idle speed (%)	20
3 Stage 1 idle range (°F)	80.0
4 Stage 1 set point (°F)	85.0
5 Stage 1 differential (°F)	86.5
6 Stage 2 idle speed (%)	20
7 Stage 2 idle range (°F)	87.0
8 Stage 2 set point (°F)	87.0
9 Stage 2 differential (°F)	88.5
10 Stage 3 set point (°F)	89.0
11 Stage 4 set point (°F)	91.0
12 Stage 5 set point (°F)	84.0
13 and 14 are not used in the example.	
15 High temperature alarm (°F)	95.0
16 Low temperature alarm (°F)	80.0
17 and 18 are not relevant in the example.	
19 Variable 1 configuration	CL 1
20 Variable 2 configuration	CL 1
21 Stage 3 configuration	COOL
22 Stage 4 configuration	COOL
23 Stage 5 configuration	HEAT
24 to 29 are not relevant in the example.	
30 High temperature enable	YES
31 Low temperature enable	YES



Programming the parameters

Programming the parameters explains parameters 1 to 23 and how to program them. For information about parameter 0, read **Selecting the operating program** on page 42.

Programming the group set point, parameter 1

The group set point is the target or desired temperature for the zone. It is also the temperature tracked by the individual stages. The individual set points for each variable and relay stage will be adjusted relative to the group set point for that zone. For example, if you lower the group set point by 5 degrees, the set points for the variable and relay stages will also be lowered by 5 degrees.

Make sure you set the group set point before setting the individual set points.

For a more-detailed description of how all settings work together, read **Understanding how the SEC-HD operates** on page 29.



Use temperature override to test your high and low temperature alarms instead of adjusting the group set point. In temperature override mode, the alarm relay and status LEDs both operate as if they were in a real alarm situation. For more information, read **Using temperature override mode** on page 44.



The examples in the procedure below use program A, which displays as **A Pr**. Program B displays as **b Pr**, C displays as **c Pr**, and so on.

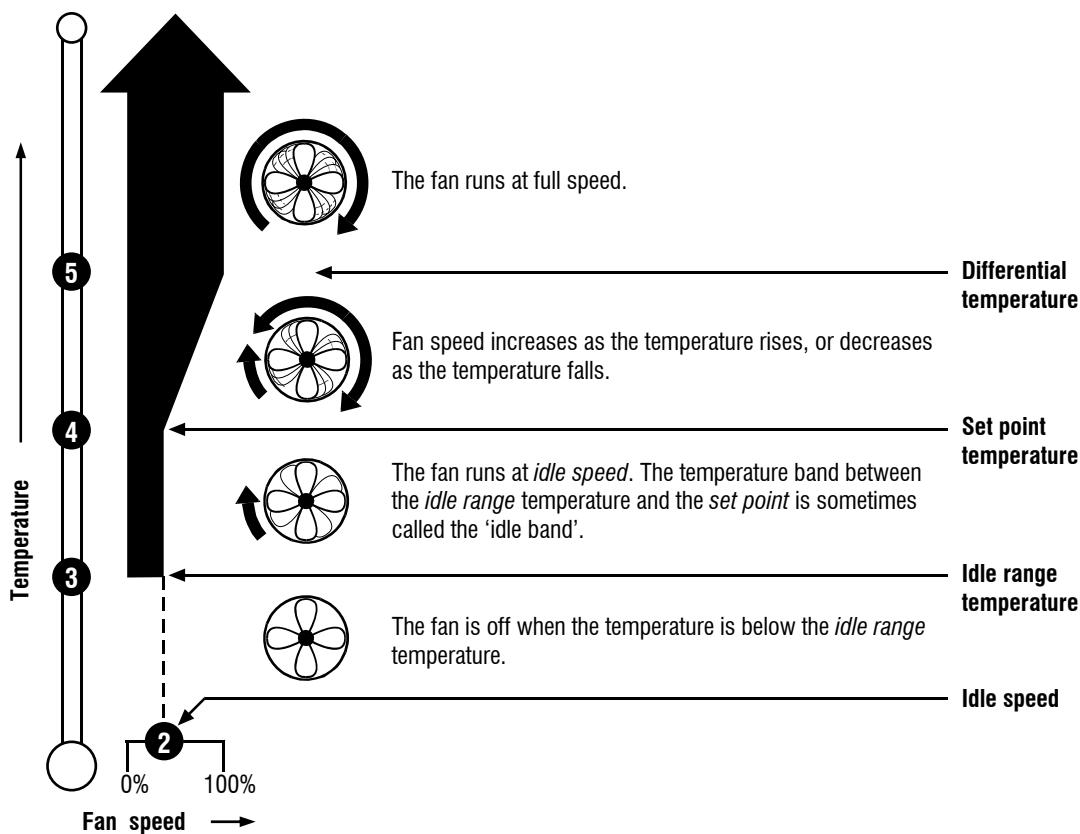
To program the group set point

1. Press **Program** until the program you want to adjust displays, for example **A Pr** for program A.
2. Press **Select**.
The display shows **A 0**, the first item in the Program menu.
3. Press **Up** until **A 1** displays and then press **Select**.
The display shows the current setting.
4. Press **Up** or **Down** to adjust the setting and then press **Select**.
The control returns to the Program menu.
5. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

Programming variable stages, parameters 2 to 9

There are four settings to program for each variable stage. The following diagram explains how the settings work together. For a more-detailed description of how all settings work together, read **Understanding how the SEC-HD operates** on page 29.

- ◆ When the temperature is below the *idle range*, the fan is off.
- ◆ When the temperature reaches the *idle range*, the fan runs at full speed for three seconds and then runs at the *idle speed*. The fan continues to run at the *idle speed* until the temperature rises to the *set point*.
- ◆ When the temperature is between the *set point* and *differential*, fan speed increases or decreases proportionally with the temperature.
- ◆ When the temperature is at or above the *differential*, the fan runs at full speed.



Use the **Variable stage settings worksheet** on page 61 when programming variable stages.



- ◊ If you need to connect more cooling elements than you have relays available, and you are not using both variable stages, you can use an available variable stage as an ON/OFF stage (for 120/230 VAC-powered equipment only).
- ◊ Set the *idle speed* to 100% and *idle range* to the temperature at which you want the stage to switch on/off. You no longer have "variable" speed or power; instead, you have either "full on" or "full off", the same as a regular cooling stage. The *set point* and *differential* settings have no effect when you use a variable stage this way.
- ◊ The *set point* and *differential* settings must be greater than the *idle range*.

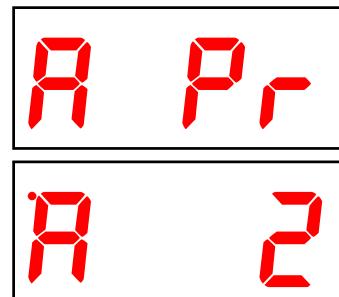
To program variable stage settings



The examples in the following procedure use program A and variable stage 1.

- ◊ Program A displays as **A Pr**, program B displays as **b Pr**, program C displays as **c Pr**, and so on.
- ◊ Variable stage 1 uses Program settings menu items 2, 3, 4, and 5. For variable stage 2, use menu items 6, 7, 8, and 9.

1. Press **Program** until the program you want to adjust displays, for example **A Pr** for program A.
2. Press **Select**.
The display shows **A 0**, the first item in the Program menu.
3. Press **Up** until the setting you want to adjust displays, for example **A 2** for *Stage 1 idle speed* and then press **Select**.
The display shows the current setting.
4. Press **Up** or **Down** to adjust the setting and then press **Select**.
The control returns to the Program menu.
5. Repeat steps 3 to 4 for each setting you want to adjust.
6. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.



Programming relay stages, parameters 10 to 14

There are two types of heating and cooling stage setups: *normal* and *proportional*. Normal is available for stages 3 to 5. Proportional is available only for stage 5.

For a detailed description of how normal settings work together with all others, read **Understanding how the SEC-HD operates** on page 29.

How proportional control works (stage 5 only)

Proportional heating

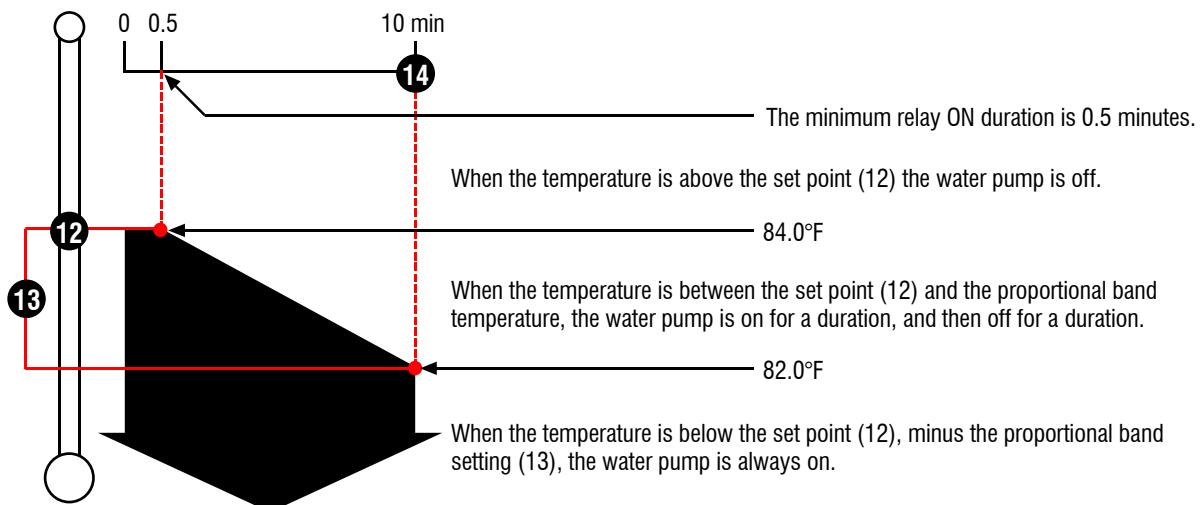
When configured for proportional heating, the relay controls a pump or valve and operates as a proportional cycle timer. Typical use for proportional heating is in-floor heating using water pipes, which is often in livestock buildings.

The following example uses the default settings for *program A*.

- ◆ Parameter 12, *Stage 5 set point* = 84.0°F
- ◆ Parameter 13, *Stage 5 P-band temperature* = 2.0°F
- ◆ Parameter 14, *Stage 5 P-band interval* = 10 minutes

$10 \text{ minutes} \div 2.0 = 5 \text{ minutes change per degree}$, therefore:

- ◆ At 84.0: 0.5 min on (this is the minimum time regardless of interval parameter), 9.5 min off
- ◆ At 83.5: 2.5 min on, 7.5 min off
- ◆ At 83.0: 5 min on, 5 min off
- ◆ At 82.5: 7.5 min on, 2.5 min off
- ◆ At 82.0: 10 min on, 0 min off (always on)



Proportional cooling

When configured for proportional cooling, the relay controls a water pump or sprinkler solenoid and operates as a proportional cycle timer. The relay switches on for a portion of the cycle/interval and off for the remainder. The duration the relay is on depends on the temperature. Proportional cooling allows you to control temperatures more effectively and efficiently.

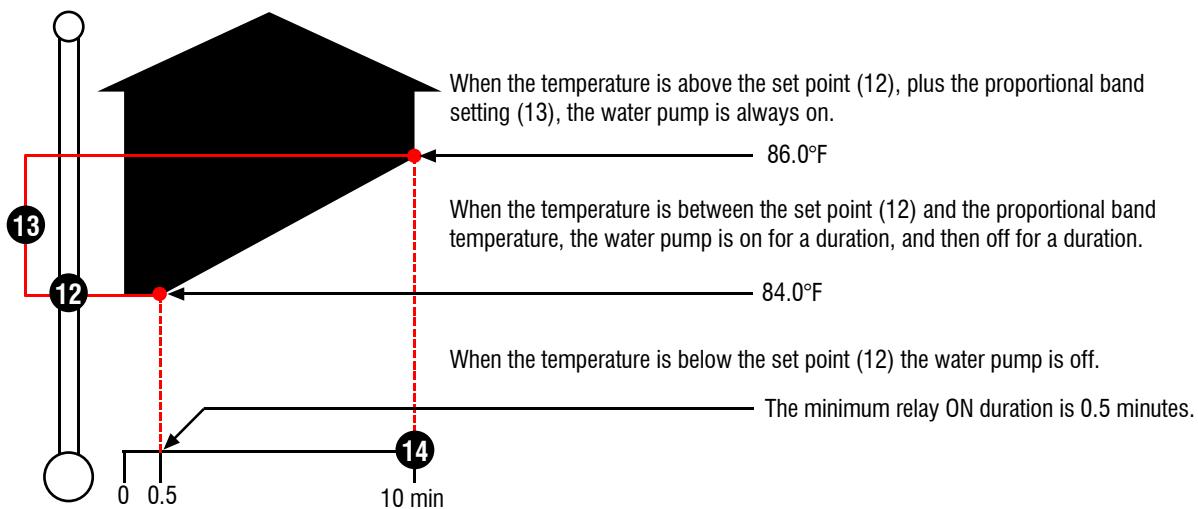
Typical use for proportional cooling is soaking or direct evaporative cooling, which is often used in hog and dairy operations.

The following example uses the default settings for *program A*.

- ◆ Parameter 12, *Stage 5 set point* = 84.0°F
- ◆ Parameter 13, *Stage 5 P-band temperature* = 2.0°F
- ◆ Parameter 14, *Stage 5 P-band interval* = 10 minutes

$10 \text{ minutes} \div 2.0 = 5 \text{ minutes change per degree}$, therefore:

- ◆ At 84.0: 0.5 min on (this is the minimum time regardless of interval parameter), 9.5 min off
- ◆ At 84.5: 2.5 min on, 7.5 min off
- ◆ At 85.0: 5 min on, 5 min off
- ◆ At 85.5: 7.5 min on, 2.5 min off
- ◆ At 86.0: 10 min on, 0 min off (always on)

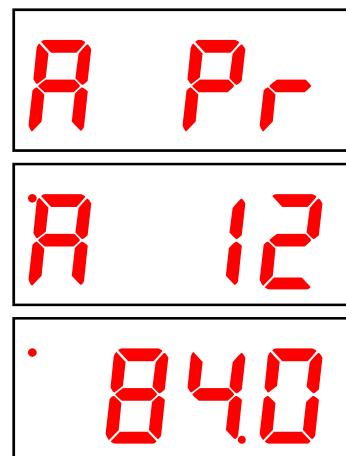


To program proportional band settings



The examples in the following procedure use program A. Program A displays as *R Pr*, program B displays as *b Pr*, program C displays as *c Pr*, and so on.

1. Press **Program** until the program you want to adjust displays, for example **A Pr** for program A.
2. Press **Select**.
The display shows **A 0**, the first item in the Program menu.
3. Press **Up** or **Down** until the setting you want to adjust displays, for example **A 12** for *Stage 5 set point* and then press **Select**.
The display shows the current setting.
4. Press **Up** or **Down** to adjust the setting and then press **Select**.
The control returns to the Program menu.
5. Repeat steps 3 to 4 for each setting you want to adjust.
6. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.



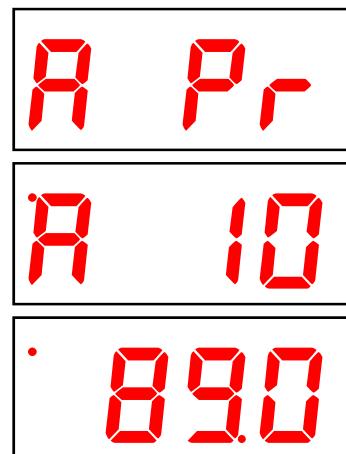
To program stage settings (no proportional band)



The examples in the following procedure use program A and stage 3.

- ◊ Program A displays as **A Pr**, program B displays as **b Pr**, program C displays as **c Pr**, and so on.
- ◊ Stage 3 uses Program settings menu item 10. For stage 4, use menu item 11. For stage 5, use menu item 12.

1. Press **Program** until the program you want to adjust displays, for example **A Pr** for program A.
2. Press **Select**.
The display shows **A 0**, the first item in the Program menu.
3. Press **Up** or **Down** until the setting you want to adjust displays, for example **A 10** for *Stage 3 set point* and then press **Select**.
The display shows the current setting.
4. Press **Up** or **Down** to adjust the setting and then press **Select**.
The control returns to the Program menu.
5. Repeat steps 3 to 4 for each setting you want to adjust.
6. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.



Programming alarm settings, parameters 15 and 16

There are four alarms. For a more-detailed description of how all settings work together, read **Understanding how the SEC-HD operates** on page 29.

- ◆ High temperature
- ◆ Low temperature
- ◆ Probe damage
- ◆ Power fail

The alarm settings for your SEC-HD determine which alarm conditions are enabled, which are disabled, and their settings. All these work together to determine how and when the alarm relay activates (in other words, signals an alarm condition).

The alarm relay activates if an enabled alarm condition is present for longer than the minimum duration of one minute. The one-minute minimum duration prevents alarms from occurring when the temperature rises or drops for just a few seconds.

For example, the high temperature alarm setting is 85.0°F. If the temperature rises to 86 degrees, but drops below 85 degrees 30 seconds later, the alarm relay does not activate. If the temperature rises to 86 degrees and stays there for more than 1 minute, the alarm relay activates. The alarm relay remains activated until the temperature drops below the alarm setting.

The exception to the one-minute minimum is the *power fail* alarm. The power fail alarm automatically triggers the relay on a loss of power.



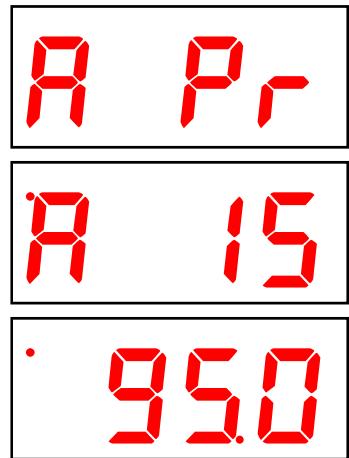
- ◊ When an alarm occurs, the **Alarm** LED switches on and the alarm message displays. For more information about acknowledging and responding to alarms, read **Acknowledging alarms** on page 42.
- ◊ Use temperature override to test your high and low temperature alarms instead of adjusting the group set point. In temperature override mode, the alarm relay and status LEDs both operate as if they were in a real alarm situation. For more information, read **Using temperature override mode** on page 44.
- ◊ Use the **Alarm settings worksheet** on page 62 when programming alarms.

To program high and low temperature alarm settings



The examples in the following procedure use program A. Program A displays as *R Pr*, program B displays as *b Pr*, program C displays as *C Pr*, and program D displays as *d Pr*.

1. Press **Program** until the program you want to adjust displays, for example **A Pr** for program A.
2. Press **Select**.
The display shows **R 0**, the first item in the Program menu.
3. Press **Down** until the setting you want to adjust displays, for example **R 15** for *High temperature alarm*, and then press **Select**.
The display shows the current setting.
4. Press **Up** or **Down** to adjust the setting and then press **Select**.
The control returns to the Program menu.
5. Repeat steps 3 to 4 for each setting you want to adjust.
6. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

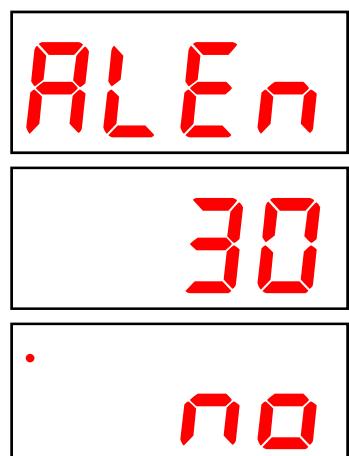


To enable or disable alarms



When you enable or disable an alarm, you do it for all programs and stages.

1. Press **Program** until **ALEn** displays and then press **Select**.
The display shows **30**, the first item in the Alarm enable menu.
2. To enable or disable the *high temperature alarm*, press **Select**.
The display shows the current configuration.
 - a) Press **Up** or **Down** to toggle between **no** (not enabled) and **YES** (enabled) and then press **Select**.
The control returns to the Alarm enable menu.
3. To enable or disable the *low temperature alarm*, press **Up** or **Down** until **31** displays and then press **Select**.
The display shows the current configuration.
 - a) Press **Up** or **Down** to toggle between **no** and **YES** and then press **Select**.
The control returns to the Alarm enable menu.
4. To enable or disable the *probe damage alarm*, press **Up** or **Down** until **32** displays and then press **Select**.
The display shows the current configuration.
 - a) Press **Up** or **Down** to toggle between **no** and **YES** and then press **Select**.
The control returns to the Alarm enable menu.



5. To enable or disable the *power fail alarm*, press **Up** or **Down** until **33** displays and then press **Select**.

The display shows the current configuration.

- a) Press **Up** or **Down** to toggle between **no** and **YES** and then press **Select**.
The control returns to the Alarm enable menu.

6. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

Chapter 5: Monitoring and maintaining your SEC-HD

Chapter 5 explains how to monitor the SEC-HD after you have installed, configured, and programmed it. Topics in chapter 5 include:

- ◆ **Monitoring your SEC-HD** below
- ◆ **Testing settings and equipment** on page 43
- ◆ **Servicing and maintaining your SEC-HD** on page 45

Monitoring your SEC-HD

Your SEC-HD displays temperature, alarm, and status information. Monitoring the control regularly gives you a better idea of what is going on in your facility. When in normal operation, the display shows the ambient temperature.

Displaying the minimum and maximum temperatures

The SEC-HD logs minimum and maximum temperatures. You can view and reset the temperatures.

To view the minimum temperature

At the main display, press **Down**.

The display shows the lowest temperature since being reset.



To view the maximum temperature

At the main display, press **Up**.

The display shows the highest temperature since being reset.



To reset the minimum and maximum temperatures

At the main display, press **Program** and **Down**.

The control resets the minimum and maximum temperatures.

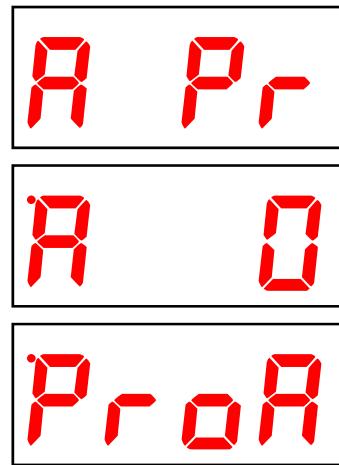
Selecting the operating program

The SEC-HD has four configurable programs, *A*, *B*, *C*, *D*, *E*, *F*, and *G* if you are running a livestock or poultry operation, you might use different programs for different stages of development. Another option is to use different programs for different seasons.

The default operating program is *program A*. Any of the seven programs can be the operating program. For a list of the factory defaults for the programs, see the table starting on page 57.

To select the operating program

1. Press **Program** until one of the seven Program settings menus displays, for example **A Pr** for program A. *At this point, it does not matter which program menu you select.*
2. Press **Select**.
The display shows **A 0**, the first item in the Program menu.
3. Press **Select**.
The display shows the current operating program.
4. Press **Up** or **Down** to change the operating program and then press **Select**.
The control returns to the Program menu.
5. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.



Acknowledging alarms

The alarm relay activates if an enabled alarm condition is present for longer than the minimum duration of one minute. The one-minute minimum duration prevents alarms from occurring when the temperature rises or drops for just a few seconds.

The exception to the one-minute minimum is the *power fail* alarm. The power fail alarm automatically triggers the relay on a loss of power.

When an alarm occurs, the alarm relay activates, the LED for **ALARM** switches on, and the alarm message displays. If there is more than one message, after acknowledging the first alarm, the next one displays.

For example, if you have a high temperature and probe damage alarm, the display shows **H-RL**. After acknowledging the high temperature alarm, the display shows **PbRd**. When all alarms have been acknowledged, the display shows the temperature.

To acknowledge alarms

Press **Select**.

If there was only one alarm message, the SEC-HD clears the message and returns to the main display. If there are additional alarm messages, the SEC-HD displays the next message.



For a list of alarm messages, their descriptions, and possible resolutions, read **Alarm and error messages** on page 54.



- ◊ Acknowledging alarms clears the alarm message; it does not deactivate the alarm relay or LED. To deactivate the alarm relay, resolve the problem causing the alarm condition.
- ◊ If you acknowledge the alarm, but do not resolve the problem causing the alarm condition, the alarm message displays again after five minutes without any key presses.
- ◊ If the condition causing the alarm returns to normal (for example, the temperature drops below the high alarm setting), the alarm relay and LED deactivate, but the alarm message remains.

Testing settings and equipment

The SEC-HD has two test utilities: *stage override mode* and *temperature override mode*.

Using stage override mode

Stage override mode is for individually testing the installation and equipment connected to the SEC-HD. When you enter stage override mode, all stages switch off. You can then change the output of the stages: 0 to 100% for variable stages, OFF or ON for relay stages and the alarm relay.

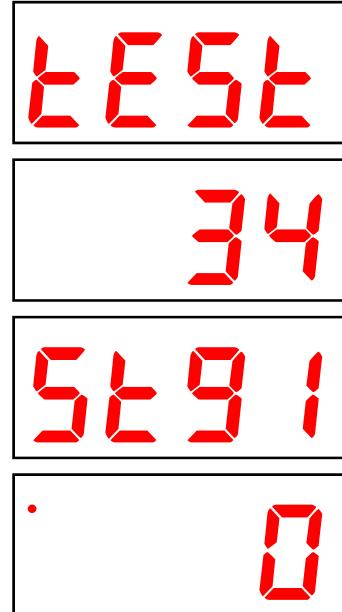
All equipment remains at the state you set it until you leave stage override mode, then it returns to normal, programmed operation. For example, if stage 3 is a cooling stage and you switch it ON, it remains on until you leave stage override mode.



- ◊ When the SEC-HD is in stage override mode, it does not operate the equipment according to the measured temperature.
- ◊ The SEC-HD does not exit test mode on its own. When you are finished testing, press **Back** until the control exits test mode.

To use stage override mode

1. Press **Program** until **TEST** displays and then press **Select**.
The display shows **34**, the first item in the Test menu.
2. Press **Select**.
The display shows **ST91**, the first item in the Stage override submenu.
3. Press **Up** or **Down** until the stage you want to test displays, for example **RLA** for the alarm relay and then press **Select**.
The display shows the current setting.
4. Press **Up** or **Down** to adjust the setting and then press **Select**.
The control returns to the Stage override menu.
5. Repeat steps 3 to 4 for each stage you want to test.
6. To return to the Main menu, press **Back** twice. To return to the Main display, press **Back** three times.



Using temperature override mode

Temperature override mode is for testing the SEC-HD configuration and settings. It allows you to test the settings by simulating the temperature. Instead of adjusting the output of a variable stage or state of a relay, you adjust the "test temperature".

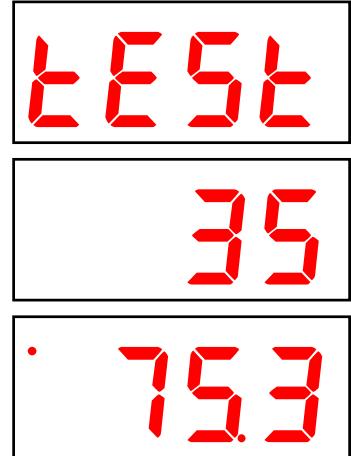
As you increase or decrease the test temperature, all stages and relays operate according to their programmed settings and the test temperature, giving you an idea of how your system performs over a full range of temperatures.



- ◊ When the SEC-HD is in temperature override mode, it operates according to the test temperature, not according to the temperature measured by the probe.
- ◊ The SEC-HD does not exit test mode automatically. When you are finished testing, press **Back** until the control exits test mode.

To use temperature override mode

1. Press **Program** until **TEST** displays and then press **Select**.
The display shows **34**, the first item in the Test menu.
2. Press **Up** or **Down** until **35** displays and then press **Select**.
The display shows the current temperature, which is now the test temperature.
3. Press **Up** or **Down** to adjust the test temperature.
The control responds to the changes in the test temperature.
4. To return to the Main menu, press **Back** twice. To return to the Main display, press **Back** three times.



Servicing and maintaining your SEC-HD

Topics in this section include:

- ◆ **Enabling and disabling ventilation** (below)
- ◆ **Restoring the factory defaults, parameter 27** (on page 46)
- ◆ **Saving and restoring settings, parameters 25 and 26** (on page 47)
- ◆ **Displaying the firmware version, parameter 29** (on page 48)
- ◆ **Updating the firmware, parameter 28** (on page 49)
- ◆ **Servicing the control** (on page 50)

Enabling and disabling ventilation

Normally, ventilation is *enabled* and the variable and relay stages function according to the program settings. This is the default setting and we refer to it as *normal operation*.

Occasionally, you might want to disable the ventilation. For example, if a room is vacant, you might want to disable ventilation to conserve energy.

When ventilation is *disabled*:

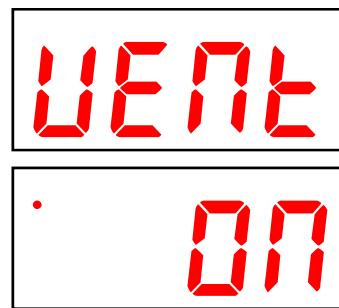
- ◆ Variable stages are off
- ◆ Cooling stages (relay) are off
- ◆ Heating stages function normally
- ◆ The display alternates between the current temperature and **OFF**
- ◆ Alarms do not display



DO NOT use the disable ventilation function to shut down fans while working on wiring. When working on any wiring, switch OFF the power at the source.

To enable or disable ventilation

1. Press **Program** until **VENT** displays and then press **Select**.
The display shows the current setting.
2. Press **Up** or **Down** to toggle between **OFF** and **ON** and then press **Select**.
The control returns to the Main menu.
3. To return to the Main display, press **Back**.



Restoring the factory defaults, parameter **27**

When your SEC-HD leaves the factory, it comes with default settings and configuration. When you program your SEC-HD, you change its configuration and settings. Resetting your SEC-HD erases all the configuration and settings you programmed and restores them to what they were when the control left the factory.

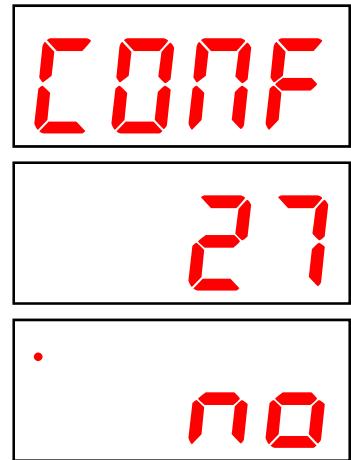
For a list of the factory defaults, read **Appendix C: Factory defaults** on page 57.



- ◊ **Restore the factory defaults only as a last resort. It erases ALL your configuration and settings and you will have to reconfigure the control.**
- ◊ If you restore your SEC-HD to its factory defaults, disconnect the power to all loads and then reconfigure the control before restoring power to the loads.

To restore the factory defaults

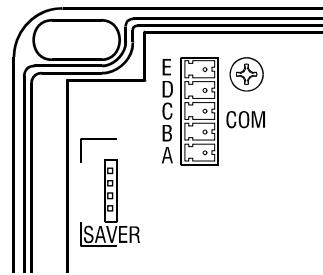
1. Press **Program** until **CONF** displays and then press **Select**.
The display shows **17**, the first item in the Configuration menu.
2. Press **Down** until **27** displays and then press **Select**.
3. Press **Up** or **Down** to change the **no** to **YES** and then press **Select**.
The control restores the factory defaults. When complete, the display shows **doneE**.
4. To return to the Configuration menu, press **Back** once. To return to the Main menu, press **Back** twice. To return to the Main display, press **Back** three times.



Saving and restoring settings, parameters 25 and 26

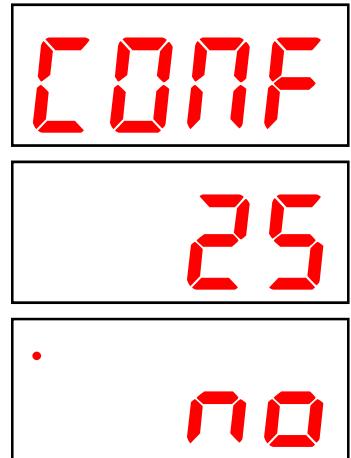
The SEC-HD Saver is an innovative and easy-to-use product that allows you to store your SEC-HD configuration and settings.

The SEC-HD Saver stores a complete copy of all a SEC-HD's configuration and settings. You can restore the configuration and settings any time, or even use them to set up new SEC-HDs in seconds!



To save your settings

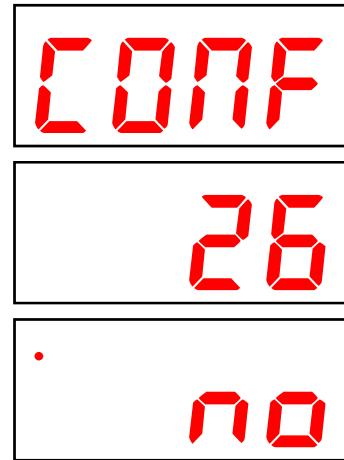
1. Loosen the four screws in the SEC-HD enclosure and then gently remove the cover. Make sure not to disconnect the ribbon cable.
2. Insert the SEC-HD Saver into the connector marked SAVER on the inside top-left of the cover.
3. Press **Program** until **CONF** displays and then press **Select**.
The display shows **17**, the first item in the Configuration menu.
4. Press **Down** until **25** displays and then press **Select**.
5. Press **Up** or **Down** to change the **no** to **YES** and then press **Select**.
The control saves the information to the SEC-HD Saver. When complete, the display shows **doneE**.
6. To return to the Configuration menu, press **Back** once. To return to the Main menu, press **Back** twice. To return to the Main display, press **Back** three times.



7. Remove the SEC-HD Saver.
8. Replace the cover and then tighten the four screws.

To restore your settings

1. Loosen the four screws in the SEC-HD enclosure and then gently remove the cover. Make sure not to disconnect the ribbon cable.
2. Insert the SEC-HD Saver into the connector marked SAVER on the inside top-left of the cover.
3. Press **Program** until **CONF** displays and then press **Select**.
The display shows **17**, the first item in the Configuration menu.
4. Press **Down** until **26** displays and then press **Select**.
5. Press **Up** or **Down** to change the **no** to **YES** and then press **Select**.
The control reads the information from the SEC-HD Saver. When complete, the display shows **done**.
6. To return to the Configuration menu, press **Back** once. To return to the Main menu, press **Back** twice. To return to the Main display, press **Back** three times.
7. Remove the SEC-HD Saver.
8. Replace the cover and then tighten the four screws.



Displaying the firmware version, parameter 29

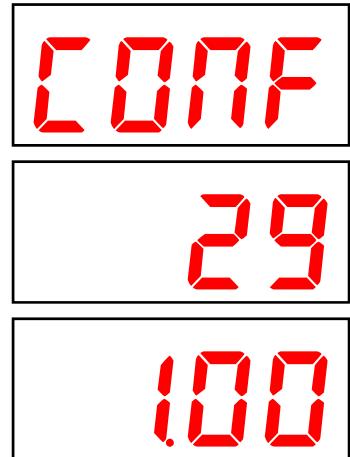
Firmware is similar to operating system software for a computer. Firmware contains instructions that tell the SEC-HD how it operates. Just like computer operating systems (such as Windows™ 7) have version numbers, the firmware has a version number.

If you need to contact Phason Customer Support about your SEC-HD, you might need to provide them with the firmware version of your control. For more information about technical support, read **Service and technical support** at the front of the manual.

The SEC-HD displays the firmware version as a number in the format #.##.

To display the firmware version

1. Press **Program** until **CONF** displays and then press **Select**.
The display shows **24**, the first item in the Configuration menu.
2. Press **Down** until **29** displays and then press **Select**.
The display shows the firmware version.
3. To return to the Configuration menu, press **Back** once. To return to the Main menu, press **Back** twice. To return to the Main display, press **Back** three times.



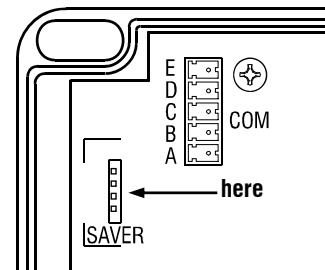
Updating the firmware, parameter 28

The optional SEC-HD Updater is an innovative and easy-to-use product that allows you to upgrade your SEC-HD's firmware. Phason constantly improves and adds new features to their products. With the SEC-HD Updater, you can upgrade the firmware in your SEC-HD as these features become available. The SEC-HD Updater takes only seconds to use and can upgrade all the SEC-HD controls at your site.

There are two methods for updating the SEC-HD firmware.

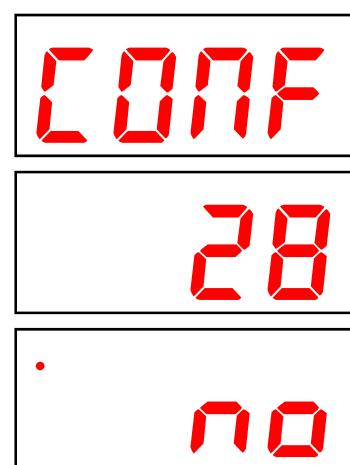
- ◆ **Power on:** the power on method allows you to update the SEC-HD firmware using the menu system, without having to switch the incoming power off and then on. If the power on method fails, use the power off method.
- ◆ **Power off:** the power off method allows you to update the SEC-HD firmware by switching the incoming power off and then on. Use the power off method if the power on method fails.

The inside of the SEC-HD cover is where you connect the SEC-HD Updater. The cover label must face the right when you plug the updater into the socket.



To update the firmware using the “power on” method

1. Loosen the four screws in the SEC-HD enclosure and then gently remove the cover. Make sure not to disconnect the ribbon cable.
2. Insert the SEC-HD Updater into the connector marked **SAVER** on the inside top-left of the cover.
3. Press **Program** until **CONF** displays and then press **Select**.
The display shows **17**, the first item in the Configuration menu.



4. Press **Down** until **28** displays and then press **Select**.
5. Press **Up** or **Down** to change the **no** to **YES** and then press **Select**.
The SEC-HD updates its firmware. During the update, the display is blank and the control beeps.
When the update is complete, the display shows **----** for a couple seconds and then shows the ambient temperature.
6. Remove the SEC-HD Updater.
7. Verify that the control functions properly.
8. Replace the cover and then tighten the four screws.

To update the firmware using the “power off” method

1. Loosen the four screws in the SEC-HD enclosure and then gently remove the cover. Make sure not to disconnect the ribbon cable.
2. Insert the SEC-HD Updater into the connector marked **SAVER** on the inside top-left of the cover.
3. Switch off the power to the SEC-HD for at least five seconds.
4. Switch on the power to the SEC-HD.
The SEC-HD updates its firmware. During the update, the display is blank and the control beeps.
When the update is complete, the display shows **----** for a couple seconds and then shows the ambient temperature.
5. Remove the SEC-HD Updater.
6. Verify that the control functions properly.
7. Replace the cover and then tighten the four screws.

Servicing the control

Servicing and maintaining your SEC-HD will extend the life of the control and your equipment.



Before installing or servicing your SEC-HD, switch OFF the power at the source.

Cleaning

- ◆ Use caution when washing the room with a high-pressure washer.
- ◆ To clean the surface of the control, wipe it with a damp cloth.



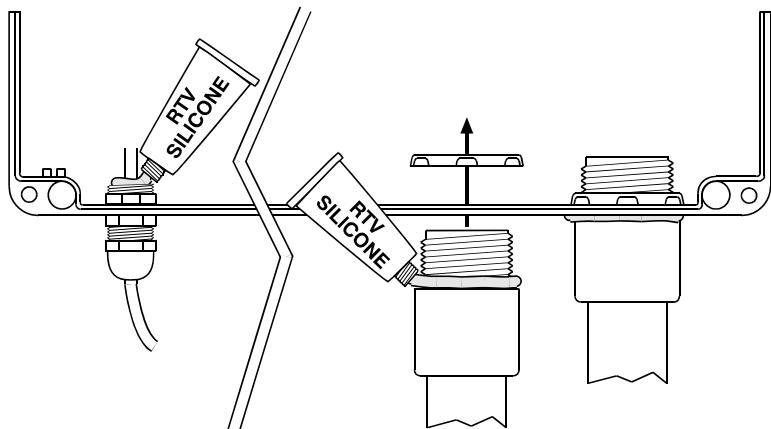
- ◊ DO NOT direct a high-pressure washer at the control.
- ◊ Do not use harsh or abrasive cleaners or rub the surface of the control with your bare hands.

Moisture

Moisture will not cause problems with the control if you take proper care during installation.

1. After the first two weeks of operation, remove the cover from the unit and check inside for moisture. Be sure to turn off the power to the control before opening the cover.
2. If there is moisture present, wipe it out with a dry cloth and check the cable entry points and rubber gasket for proper sealing.
3. If the cable connectors are not sealing, apply RTV or Silicon II (non acetic acid) sealant around the cable.

Some silicone sealants release acetic acid while curing. This can cause corrosion and damage the control. Let the silicone cure completely (one to three days) with the cover open and ensure no moisture enters the control. Failure to do this might damage the control and void the warranty.



4. Open and inspect the control after two weeks to verify it is sealing properly.



Open and inspect the control for moisture once a year. Proper care and maintenance will extend the life of the control.

Appendices

This section contains reference information that is useful when installing, configuring, setting up, or troubleshooting your SEC-HD.

- ◆ **Appendix A: Glossary** below
- ◆ **Appendix B: Troubleshooting** on page 54
- ◆ **Appendix C: Factory defaults** on page 57
- ◆ **Appendix D: Installation worksheet** on page 59
- ◆ **Appendix E: Configuration worksheets** on page 60
- ◆ **Appendix F: Settings worksheets** on page 61
- ◆ **Appendix G: Motor curves** on page 63

Appendix A: Glossary

AC power	Utility companies supply electrical power as alternating current, which is referred to as AC power.
control elements	Devices connected to your SEC-HD, such as fans, heaters, actuators, and so on.
differential	The temperature setting above which a variable stage's fan runs at full speed. For more information, read Programming variable stages, parameters 2 to 9 on page 33.
firmware	The internal program instructions of your SEC-HD. You can update the firmware version of your SEC-HD to the latest version using a SEC-HD Updater. For more information, read Updating the firmware on page 49.
group set point	The desired temperature for the room. For more information, read Programming the group set point, parameter 1 on page 32.

hysteresis	The number of degrees above the set point that a heating stage or relay switches off, and the number of degrees below the set point that a cooling stage or relay switches off. For example, a household thermostat might switch on a furnace at 68 °F when the house is cooling down, but switch it off at 72 °F when the house is warming up. The difference between these two values is the hysteresis. For more information, read Configuring hysteresis, parameter on page 25.
idle range	The temperature setting below which a variable stage's fan is off and the inlet is closed. When the temperature is between the idle range and set point, the fan operates at idle speed and the inlet is open the corresponding amount. For more information, read Programming variable stages, parameters 2 to 9 on page 33.
idle speed	The percentage of full power at which a variable speed fan operates for minimum ventilation. For more information, read Programming variable stages, parameters 2 to 9 on page 33.
minimum duration	The minimum amount of time an alarm condition must be present before the SEC-HD signals an alarm. The minimum duration (one minute) prevents alarms from activating when the temperature rises or drops for just a few seconds. For more information, read Programming alarm settings, parameters 15 and on page 38.
minimum idle	See <i>idle speed</i> .
relay	An electromagnetic switch that is either on (closed) or off (open).
set point	For variable stages, the temperature above which fan speed increases toward its maximum and the inlet opens proportionally. For more information, read Programming variable stages, parameters 2 to 9 on page 33. For relay stages, the temperature at which the stage switches between the OFF and ON state. For more information, read Programming relay stages, parameters 10 to 14 on page 27.
spikes	Short-term deviations or changes from a desired voltage level or signal. These deviations can cause damage to electronic devices, or cause them to malfunction. Spikes are often caused by sudden excess power, also known as 'power surges', or by drops in power, known as 'brown outs'. For more information, read Understanding power surges and surge suppression on page 9.

terminal block	The part of your SEC-HD where you connect the wires for incoming power, control elements, and so on. For more information, read SEC-HD layout on page 13.
voltage	Electromotive force or potential difference, usually expressed in volts (V).

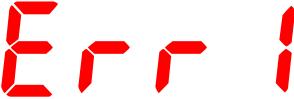
Appendix B: Troubleshooting

- ◆ If you see an alarm message and are not sure what it means, look it up in the **Alarm and error messages** table below and then follow the instructions for resolving the alarm condition.
- ◆ If you are having a problem using your SEC-HD, see if the problem is described in the **Troubleshooting** table on page 55 and then follow the directions for correcting the problem.

Alarm and error messages

The following table lists the alarm and error messages, the possible causes, and their possible solutions. If you see a message and are not sure what it means, look it up in the table and then follow the instructions for resolving the condition.

Alarm message	Possible cause	Possible solution
H - RL High temperature alarm	The temperature has gone above the high temperature alarm point.	<ul style="list-style-type: none"> ◊ Try to lower the temperature by turning heaters down or off, or by increasing or turning on cooling elements (such as fans or misters), or by a combination of both. ◊ Check the temperature probes. ◊ Check to see if a fan has failed. ◊ Check the alarm settings. For more information, read Programming alarm settings on page 38.
L - RL Low temperature alarm	The temperature has gone below the low temperature alarm point.	<ul style="list-style-type: none"> ◊ Try to raise the temperature by turning heaters up or on, or by decreasing or turning off cooling elements (such as fans or misters), or by a combination of both. ◊ Check the temperature probes. ◊ Check to see if a heater has failed. ◊ Check the alarm settings. For more information, read Programming alarm settings on page 38.

 Probe damage alarm	A temperature probe is damaged or disconnected.	<ul style="list-style-type: none"> ◊ Check the wire between the control and the probe. Any wire damage can cause the alarm. ◊ Replace or reconnect the temperature probe. The control should recover automatically.
 Power fail alarm	There has been a power failure.	<ul style="list-style-type: none"> ◊ Check to see why the power failed and then fix the problem.
 Error 1 - SAVER error	<p>The SEC-HD Saver is not in place when trying to save or restore settings.</p> <p>The Saver inserted is not an SEC-HD Saver.</p> <p>The Saver inserted has invalid settings on it.</p>	<ul style="list-style-type: none"> ◊ Make sure the SEC-HD Saver is inserted correctly and then try again. ◊ Remove the Saver and then insert an SEC-HD Saver. ◊ Resave the settings from the SEC-HD to the SEC-HD Saver.

Troubleshooting

The following table lists some problems, possible causes, and possible solutions. If you are having a problem using your SEC-HD, see if the problem is described in the Troubleshooting table and then follow the directions for correcting the problem.

Problem	Possible cause	Possible solution
Power supply components blown out	Power surge, brownout, or power outage	<ul style="list-style-type: none"> ◊ Avoid the problem in future by providing proper voltage and protection for the control.
Burn marks on boards and components		
Motors and fans slow down or stop		
No power and/or display	<p>A circuit breaker at service panel is off or tripped.</p> <p>Incorrect incoming power wiring</p> <p>The display board connect cable is not plugged into the control board properly.</p> <p>The 115/230 VAC switch is in the wrong position</p>	<ul style="list-style-type: none"> ◊ Reset the circuit breaker. ◊ Correct the wiring. ◊ Plug in the display board cable. For more information, read SEC-HD layout on page 13. ◊ Switch off the power, set the switch to the correct setting, and then switch on the power. For more information, read SEC-HD layout on page 13.

Temperature does not change	The control is in temperature override mode.	◊ Exit test mode. For more information, see Using temperature override mode on page 44.
Display showing unusually high or low temperature	<p>The probe is not a Phason probe.</p> <p>The extension cable connected to the temperature probe is providing a poor connection</p> <p>Damaged probe</p>	◊ Remove the probe and then install a Phason probe. ◊ Check the extension cable connection and re-solder it if necessary. ◊ Replace the temperature probe.
Variable fan runs at maximum	<p>Incorrect wiring</p> <p>The <i>idle speed</i> is too high.</p> <p>The <i>differential</i> setting is the same as the <i>set point</i>.</p> <p>Incorrect motor curve</p>	◊ Correct the wiring. For more information, read Connecting variable-stage cooling elements on page 16. ◊ Decrease the <i>idle speed</i> setting. For more information, read Programming variable stages on page 33. ◊ Adjust the <i>set point</i> to the desired temperature. For more information, read Programming variable stages on page 33. ◊ Configure the stage to use the other motor curve. For more information, read Configuring the stages on page 26.
Variable fan not running	<p>Incorrect wiring</p> <p>The fuse is open or blown.</p> <p>The variable stage is configured as OFF</p> <p>The <i>idle speed</i> setting is too low.</p> <p>The <i>idle range</i> temperature setting is too high.</p> <p>The temperature <i>set point</i> is above room temperature.</p> <p>There is no power to the fan.</p> <p>Faulty fan/heater</p> <p>Circuit breaker open</p>	◊ Correct the wiring. For more information, read Connecting variable-stage cooling elements on page 16. ◊ Check why the fuse was blown and repair any problems. Replace the fuse. ◊ Configure the variable stage for cooling. For more information, read Configuring the stages on page 26. ◊ Increase the <i>idle speed</i> setting. For more information, read Programming variable stages on page 33. ◊ Decrease the <i>idle range</i> temperature setting. For more information, read Programming variable stages on page 33. ◊ Adjust the <i>set point</i> to the desired temperature. For more information, read Programming variable stages on page 33. ◊ Switch on the power. ◊ Replace the equipment. ◊ Reset the breaker.
Variable speed fan responds to only a small portion of the 0 to 100% range	Incorrect motor curve	◊ Configure the stage to use the other motor curve. For more information, read Configuring the stages on page 26.
Variable speed fan comes on, runs at full speed, and then turns off, keeps cycling.	The hysteresis is not high enough. The outside temperature is rising and falling quickly. This happens most often in the spring and fall.	◊ Adjust the hysteresis setting.

Relay does not switch ON the load	Incorrect wiring The stage is configured as OFF, as cool for a heater, or as heat for a fan. The set point is incorrect	◊ Correct the wiring. For more information, read the appropriate installation section. ◊ Configure the relay properly. For more information, read Configuring relay stages, parameters 21 to 23 on page 27. ◊ Adjust the setting. For more information, read the appropriate programming section.
	No power to the load Faulty equipment Circuit breaker open Blown relay	◊ Switch on the power. ◊ Replace the equipment. ◊ Reset the breaker. ◊ Solve the problem that caused the relay to blow and then replace the circuit board or use a different relay.
Relay does not switch OFF the load	The stage is configured as ON.	◊ Configure the relay properly. For more information, read Configuring relay stages, parameters on page 27.
Alarm relay not operating alarm system	Incorrect wiring	◊ Correct the wiring. For more information, read Connecting an alarm system on page 18.
Staged element cycles on and off	The set points are too close together with variable speed fans. The heater is too large for the room. The stage is set up as proportional control.	◊ Adjust the hysteresis setting. ◊ Move the temperature probe closer to the heater. ◊ Widen the set points. ◊ Replace the heater with a smaller output unit. ◊ Change the configuration from proportional control.

Appendix C: Factory defaults

When your SEC-HD leaves the factory, it comes with default settings and configuration. Configuring and programming your SEC-HD changes the factory defaults.

Resetting your SEC-HD erases all the configuration and settings you programmed and then restores the defaults. For more information, read **Restoring the factory defaults, parameter 27** on page 46.

The following table lists all the factory defaults and ranges.

Parameter	Default					Range/options
	A	B	C	D	E, F, G	
1 Group set point (°F/°C)	85.0	80.0	75.0	70.0	65.0	-13.0 to 125 °F (-25 to 51.7°C)
2 Stage 1 idle speed (%)	20	20	30	30	20	0 to 100 %
3 Stage 1 idle range (°F/°C)	80.0	75.0	70.0	65.0	60.0	-13.0 to 125 °F (-25 to 51.7°C)
4 Stage 1 set point (°F/°C)	85.0	80.0	75.0	70.0	65.0	-13.0 to 125 °F (-25 to 51.7°C)
5 Stage 1 differential (°F/°C)	86.5	82.0	77.0	73.0	68.0	-13.0 to 125 °F (-25 to 51.7°C)
6 Stage 2 idle speed (%)	20	20	30	30	20	0 to 100 %
7 Stage 2 idle range (°F/°C)	87.0	82.0	77.5	73.0	68.0	-13.0 to 125 °F (-25 to 51.7°C)
8 Stage 2 set point (°F/°C)	87.0	82.0	77.5	73.0	68.0	-13.0 to 125 °F (-25 to 51.7°C)
9 Stage 2 differential (°F/°C)	88.5	84.0	79.5	76.0	71.0	-13.0 to 125 °F (-25 to 51.7°C)
10 Stage 3 set point (°F/°C)	89.0	85.0	80.0	77.0	72.0	-13.0 to 125 °F (-25 to 51.7°C)
11 Stage 4 set point (°F/°C)	91.0	87.0	82.0	79.0	74.0	-13.0 to 125 °F (-25 to 51.7°C)
12 Stage 5 set point (°F/°C)	84.0	79.0	74.0	69.0	64.0	-13.0 to 125 °F (-25 to 51.7°C)
13 Stage 5 P-band temperature (°F/°C)	2.0	2.0	2.0	2.0	2	1 to 16.0°F (0.6 to 8.9°C)
14 Stage 5 P-band interval (minutes)	10	10	10	10	10	5 to 25 minutes
15 High temperature alarm (°F/°C)	95.0	90.0	90.0	85.0	85.0	-13.0 to 125 °F (-25 to 51.7°C)
16 Low temperature alarm (°F/°C)	80.0	75.0	70.0	65.0	65.0	-13.0 to 125 °F (-25 to 51.7°C)
17 Temperature unit				°F		°F/°C
18 Frequency				60		50/60 Hz
19 Stage 1 configuration				CL 1		OFF/CL 1 to CL 4
20 Stage 2 configuration				CL 1		OFF/CL 1 to CL 4
21 Stage 3 configuration				COOL		OFF/ON/COOL/ HEAT
22 Stage 4 configuration				COOL		OFF/ON/COOL/ HEAT
23 Stage 5 configuration				HEAT		OFF/ON/COOL/HEAT/P-COOL/P-HEAT
24 Hysteresis (°F/°C)				0.5		0.3 to 5.0°F (0.2 to 2.8°C)
30 High temperature enable				YES		NO/YES
31 Low temperature enable				YES		NO/YES
32 Probe damage enable				YES		NO/YES
33 Actuator jam enable				YES		NO/YES

Appendix D: Installation worksheet

Use the following worksheet to list all the equipment (fans, heaters, and so on that you want your SEC-HD to control. We recommend you make a copy of the worksheet before filling it in because you need more than one sheet or you make a mistake.



Use the **Installation worksheet** when you fill in the **Configuration worksheets** (starting on page 60).

Stage	Equipment to connect and notes
<i>Example:</i> VAR 1	36-inch variable speed fan, 2.5 FLA, 3/4 HP
VAR 1	
VAR 2	
STAGE 3	
STAGE 4	
STAGE 5	
ALARM	

Appendix E: Configuration worksheets



Use the **Installation Worksheet** on page 59 when completing the configuration worksheets.

Main control function worksheet

For each item, circle or write in the configuration.

Item	Description	Configuration
Units	The unit of measure for temperature.	°C °F
Frequency	The line frequency of the incoming power.	50 Hz 60 Hz
Hysteresis	The number of degrees above the set point that a heating stage or relay switches off, and the number of degrees below the set point that a cooling stage or relay switches off.	_____ degrees Range: 0.3 to 5.0°F (0.2 to 2.8°C)

Variable stage configuration worksheet

For each variable stage, enter a description (for reference only) and put a check mark in the appropriate column. The first two lines are an example.

Stage	Description	Off	Cool 1	Cool 2
1	Stage 1 fan		✓	
2	Unused	✓		
1				
2				

Relay configuration worksheet

For each stage, enter a description (for reference only) and put a check mark in the appropriate column. The first table is an example.

Stage	Description	Off	On	Heat	Cool	Proportional heat	Proportional cool
3	36-inch fan						
4	24-inch fans					✓	
5	Gas furnace				✓		
3							
4							
5							

Appendix F: Settings worksheets

Appendix F contains worksheets for you to use when programming your SEC-HD settings. Each worksheet contains a brief explanation of the information required. For more information about programming your SEC-HD, see **Chapter 4: Programming the SEC-HD** on page 29.

Variable stage settings worksheet

Parameter	Stage 1	Stage 2	Range/options
Group set point①			-13.0 to 125 °F (-25 to 51.7°C)
Stage # idle speed			0 to 100 %
Stage # idle range			-13.0 to 125 °F (-25 to 51.7°C)
Stage # set point①			-13.0 to 125 °F (-25 to 51.7°C)
Stage # differential			-13.0 to 125 °F (-25 to 51.7°C)

① Recommend these be set to the same value.

Relay stages worksheet

Parameter	Setting	Range/options
Stage 3 set point		-13.0 to 125 °F (-25 to 51.7°C)
Stage 4 set point		-13.0 to 125 °F (-25 to 51.7°C)
Stage 5 set point		-13.0 to 125 °F (-25 to 51.7°C)
Stage 5 P-band temperature①		1 to 16.0°F (0.6 to 8.9°C)
Stage 5 P-band interval①		5 to 25 minutes
① Required only if stage 5 is configured as proportional heat or proportional cool.		

Alarm settings worksheet

The alarm settings for your SEC-HD determine which alarm conditions are enabled, which are disabled, and their settings. All these work together to determine how and when the alarm relay activates (in other words, signals an alarm condition).

The alarm relay activates if an enabled alarm condition is present for longer than the minimum duration of one minute. The minimum duration prevents alarms from occurring when the temperature rises or drops for just a few seconds. The exception to the one-minute minimum is the *power fail* alarm. The power fail alarm automatically triggers the relay on a loss of power.

For more information, read **Programming alarm settings** on page 38.

Alarm	Configuration	Setting	Description
High temperature① <i>H-RL</i>	ON	OFF	The highest temperature to which you can safely allow your facility to rise; this cannot be lower than low temperature alarm.
Low temperature① <i>L-RL</i>	ON	OFF	The lowest temperature to which you can safely allow your facility to fall; this cannot be higher than high temperature alarm.
Probe damage <i>PbRd</i>	ON	OFF	Damaged or disconnected temperature probe
Power fail <i>PF</i>	ON	OFF	Incoming power interruption
① Temperature in °F/°C, range: -13.0 to 125 °F (-25 to 51.7°C)			

Appendix G: Motor curves

Motor curves provide a way to proportionally increase or decrease speed, regardless of motor manufacturer.

For example, a Multifan motor might require 130 VAC to run at 50% RPM, while a Marathon motor might need 100 VAC to run at 50% RPM. Without a motor curve, the Multifan motor would run at a slower RPM than the Marathon motor at the same settings.

Selecting the correct motor curve allows you to set, for example, 50 on the control, and get much closer to 50% RPM on the motor than you would otherwise.



Use manual override or test mode to test and evaluate the operation and performance of your fan motors. For more information, read **Testing settings and equipment** on page 43.

- ◆ If your fan motors are not running at approximately the correct RPM for the control settings, find your fan in the following table, and then select the motor curve for your fan manufacturer and model/specification.
- ◆ If your fan motor is not listed, use the default motor curve (curve 1). If the default motor curve does not operate your fan motor correctly, test the motor using manual override or test mode while selecting the different curves.

Manufacturer	Diameter (inches)	Model	Specifications	Recommended curve
Aerotech	09	AT09Z2	3350 RPM	2
	36	AT36Z1		4
Airstream	12	APP12F	1/4 HP, 1765 RPM	3
	36	APP36		4
Baldor	14		1/4 HP, 1700 RPM	4
	18		1/3 HP, 1700 RPM	4
	24		1/3 HP, 1140 RPM	4
Canarm	09	PLF9	1/5 HP	4
	12	PLF12		2
	14	PLF14		2
	16	PLF16	1/4 HP	2
	18			2
	12		1/3 HP, 1140 RPM	1
Choretyme (GE)	12		1/6 HP, 3400 RPM	2
Emerson	12		1/4 HP, 1700 RPM	2
	14		1/4 HP, 1700 RPM	2
Exafan	16		1/3 HP, 1700 RPM	2
	18		1/3 HP, 1700 RPM	2
	20		0.53 HP, 1700 RPM	2
	24		0.63 HP, 1700 RPM	2

Manufacturer	Diameter (inches)	Model	Specifications	Recommended curve
Franklin	10		1/6 HP, 3450 RPM	2
Leeson	14		1/4 HP, 1625 RPM	2
	18		1/3 HP, 1625 RPM	2
	24		1/3 HP, 1140 RPM	2
	24		1/2 HP, 1625 RPM	2
	36		3/4 HP, 1625 RPM	2
Magnetek	12		1/6 HP, 3300 RPM	2
	12		1/6 HP, 1725 RPM	2
	36		1/2 HP, 840 RPM	4
Marathon	12		1/4 HP, 1625 RPM	2
	24		1/2 HP, 1625 RPM	2
Multifan	18	4E45	1600 RPM	4
	20	4E50		4

Index

A

- acknowledging alarms 42–43
- active program 42
- actuator jam alarm 38
- alarm settings 38–40
- alarm systems 1, 13, 18
- averaging temperature probes 20–21

B

- buttons 6

C

- Celsius display 24
- cleaning 51
- clearing alarms 42–43
- configuring *See also* programming
 - alarm settings 38–40
 - hysteresis 25
 - relays 27–28
 - temperature units 24
 - variable stages 26–27

connecting

- alarm systems 18
- incoming power 21
- single-stage elements 14–15
- temperature probes 19
- variable-stage elements 16

contactors

..... *See* power contactors

D

- data wires 12
- defaults *See* factory defaults
- degrees *See* temperature units
- disabling
 - ventilation 45–46
- disabling alarms 39–40
- display 6
- display cable 13

displaying minimum/maximum temperatures 41

E

- electrical noise 9–10
- electrical ratings 10
- enabling
 - ventilation 45–46
- enabling alarms 39–40
- extending temperature probes 19–20

F

- factory defaults 46–47
- Fahrenheit display 24
- features 2
- filters 9–10
- firmware 48–50, 48–50
- four-zone averaging 20–21
- frequency 24–25
- fuses 13

G

- group set point 32

H

- hysteresis 25

I

- incoming power.... 13, 21, *See also* three-phase power

installation guidelines 11–12

L

- LEDs 6

M

- main display 6
- maintaining 45–46
- menu 7
- minimum/maximum temperatures 41

- moisture 50–51
motor curve 26–27
mounting 12, 14
- O**
operating frequency 24–25
operating program 42
- P**
parameters 29–31, *See also* programming or configuration
power *See* incoming power or three-phase power
power contactors 4, 11
power surges 8–9
preventing moisture 50–51
probes *See* temperature probes
programming *See also* configuring
 alarm settings 38–40
 group set point 32
 relay stages 34–37
 variable stages 33–34
proportional control 27, 35–37
- R**
relay stages 34–37
relay terminals 13
responding to alarms 42–43
restoring factory defaults 46–47
restoring settings 47–48
ribbon cable 13
routing data wires 12
- S**
saving settings 47–48
- sealing *See* moisture
SEC-HD Saver 3, 47–48
SEC-HD Updater 3, 48–50
selecting
 frequency 24–25
 temperature units 24
servicing 45–46
settings saver *See* SEC-HD Saver
stage override mode 43–44
stages *See* relay or variable
status LEDs 6
surge suppression 8–9
- T**
temperature override 32, 44–45
temperature probes 4, 13, 19–20
temperature units 24
testing 43–45
three-phase power 17
- U**
units *See* temperature, units
updating firmware 48–50
- V**
variable stage terminals 13
variable stages
 configuring 26–27
 connecting 16
 programming 33–34
version *See* firmware
voltage selection switch 13



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